

# Concurrent F77

## Version 7.2 Release Notes (Linux Native)

March 2006

0898101-7.2



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## 1.0. Introduction

Concurrent F77 supports development of Fortran 77 programs running under Concurrent Computer Corporation's RedHawk™ Linux® real-time operating system.

Concurrent F77 is based on Concurrent's Common Code Generator (CCG) technology. Concurrent F77 provides numerous switches and enhancements to provide compatibility with a number of legacy F77 compilers.

This release can target either i386 (32-bit Pentium processors) or x86\_64 (64-bit AMD64 processors) instruction architectures. However, cross-targeting between them is not supported. Only the RPMs for targeting the host machine's processor should be installed. This does not preclude installing the PowerMAX OS™ targeting cross-compiler at the same time.

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## 2.0. Documentation

Table 2-1 lists the Concurrent F77 7.2 documentation available from Concurrent.

**Table 2-1. Concurrent F77 Version 7.2 Documentation**

Manual Name	Pub. Number
<i>hf77 Fortran Reference Manual</i>	0890240-100
<i>Concurrent F77 Version 7.2 Release Notes (Linux Native)</i>	0898101-7.2

Copies of the Concurrent documentation can be ordered by contacting the Concurrent Software Support Center. The toll-free number for calls within the continental United States is 1-800-245-6453. For calls outside the continental United States, the number is 1-954-283-1822.

Additionally, the manuals listed above are available:

- online using the **nhelp** utility (*release notes only*)
- in PDF format in the **cf77-7.2/documentation** directory of the Concurrent F77 Installation CD
- on the Concurrent Computer Corporation web site at **www.ccur.com**

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## 3.0. Prerequisites

Prerequisites for Concurrent F77 Version 7.2 for both the host system and target system are as follows:

### 3.1. Host System

#### 3.1.1. Software

- Red Hat® or RedHawk Linux
- X Window System<sup>1</sup>

#### 3.1.2. Hardware

- an Intel®-based PC - 300Mhz or higher (recommended minimum configuration)
- 64MB physical memory (recommended minimum configuration)

### 3.2. Target System

#### 3.2.1. Software

- RedHawk 1.4 or later

#### 3.2.2. Hardware

- Any Pentium® 4 or AMD64-based machine supported by RedHawk

<sup>1</sup> This is a prerequisite only for the the online help package. It is not necessary for proper operation of the compiler. See “System Installation” on page 4 for more information about these packages.

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## 4.0. System Installation

Installation may be done using the standard Linux product installation mechanism, **rpm** (see **rpm(8)**).

The name of the RPMs associated with Concurrent F77 7.2 are:

```
ccur-invoker  
ccur-f77-32-7.2 (32-bit targets only)  
ccur-f77-64-7.2 (64-bit targets only)  
ccur-f77libs-32-7.2 (32-bit targets only)  
ccur-f77libs-64-7.2 (64-bit targets only)  
ccur-f77-tools-7.2  
ccur-f77help-7.2  
ccur-f77-license-7.2  
ccur-f77-manpages-7.2  
ccur-Fortran-77-32 (32-bit targets only)  
ccur-Fortran-77-64 (64-bit targets only)
```

and the files associated with these RPMs are, respectively:

```
ccur-invoker-7.2.000-*.i386.rpm  
ccur-f77-32-7.2-000-*.i386.rpm  
ccur-f77-64-7.2-000-*.i386.rpm  
ccur-f77libs-32-7.2-000-*.i386.rpm  
ccur-f77libs-64-7.2-000-*.i386.rpm  
ccur-f77-tools-7.2-000-*.i386.rpm  
ccur-f77help-7.2-000-*.i386.rpm  
ccur-f77-license-7.2-000-*.i386.rpm  
ccur-f77-manpages-7.2-000-*.i386.rpm  
ccur-Fortran-77-32-7.2*i386.rpm  
ccur-Fortran-77-64-7.2*i386.rpm
```

### NOTE

The user must be root in order to use the **rpm** product installation mechanism on the Linux system.



To install the Concurrent F77 RPMs, issue the following commands on your Linux system:

1. Insert the Concurrent F77 Installation CD in the CD-ROM drive
2. Mount the CD-ROM drive<sup>1</sup>

```
mount /media/cdrom
```

3. Change the current working directory to the mount point

```
cd /media/cdrom
```

4. Invoke the Concurrent F77 installation script

```
./install-cf77
```

You may see messages similar to the following during an install (or uninstall):

```
failed to stat /nfsfilesystem: Stale NFS file handle
```

where */nfsfilesystem* may be any NFS file system. These messages may be ignored.

5. Change the current working directory outside the **/media/cdrom** hierarchy

```
cd /
```

6. Unmount the CD-ROM drive (otherwise, you will be unable to remove the Concurrent F77 Installation CD from the CD-ROM drive)

```
umount /media/cdrom
```

To uninstall the Concurrent F77 RPMs, use the following command:

```
./uninstall-cf77
```

found on the Concurrent F77 Installation CD. (Follow the installation instructions above for mounting the CD-ROM drive, maneuvering to the correct working directory, unmounting the CD-ROM drive, etc.)

<sup>1</sup> The exact mount point of the cdrom device may vary. If in ISO9660 image file has been provided, it may be mounted with the command:

```
mount -t iso9660 -o loop /path/to/cf77-7.2.iso /media/cdrom
```

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## 5.0. Using Concurrent F77

The following should be taken into consideration when using Concurrent F77.

### 5.1. Invoking the Compiler

There are three Concurrent Fortran 77 products available separately. Each is invoked differently.

- Concurrent Fortran 77 for PowerMAX (PowerMAX)  
Native PowerPC™ compiler  
Invoked with the **f77** or **hf77** commands (as has always been the case).
- PLDE Concurrent Fortran 77 for PowerMAX (Linux)  
Intel®-to-PowerPC cross-compiler  
Invoked with the **xf77** command.
- Concurrent F77 for RedHawk Linux (Linux)  
Native Intel Pentium® and AMD64 compiler  
Invoked with the **cf77** command (due to the fact that **f77** and **hf77** already exist on Linux systems).

### 5.2. PATH and PDE\_RELEASE Considerations

To utilize the Concurrent F77 compiler, specify the following in your PATH environment variable:

```
PATH=$PATH:/usr/ccs/bin
```

The compiler should then be invoked with **cf77**. (This contrasts with PLDE cross compiler product which is invoked with **xf77**, or with the native PowerPC product which is invoked with **hf77** or **f77**).

Installing 7.2 compilers on your system will make 7.2 the default release. If the default PLDE release on your system is not 7.2, then it will be necessary to select the 7.2 release by one of the following methods:

- Use the **--rel=7.2** option on the **hf77/cf77/xf77** command line
- Set the **PDE\_RELEASE** environment variable to **7.2**
- Set the user default release (**c.release -rel 7.2 -u**)
- Set the system default release (**c.install -rel 7.2 -d**)

## 5.3. Makefile Considerations

Makefiles may already contain references to **f77**, **hf77** or **g77** commands explicitly within them. Additionally, if default rules for compilation, such as

```
.f.o:
```

are not explicitly mentioned, the **make** processor will also attempt to invoke **hf77**, **f77** or **g77**.

To invoke the Concurrent F77 compilers you can take any of the following approaches.

### 5.3.1. Explicit Modification Using hf77/cf77/xf77

Ensure that **/usr/ccs/bin** is in your **PATH** environment variable.

Modify all occurrences of **f77**, **hf77**, and **g77** to utilize **hf77**, **cf77**, or **xf77** as appropriate.

Supply default **.f.o** rules (and the like) to explicitly utilize the appropriate command.

### 5.3.2. Use of F77 Environment or Make Variables

One approach that requires minimal changes to Makefiles, etc., is to use environment variables or **make** variables to control which compiler you're using. The following commands will all build using the Concurrent Native Intel F77:

Short-lived environment variables:

```
# F77=cf77 make arguments
```

**make** variables:

```
# make arguments F77=cf77
```

Long-lived environment variables:

```
# export F77=cf77
# make arguments
```

You can also use the long-lived environment variable approach by adding the following to your login script (e.g. **.profile** or **.login** depending on your shell):

```
export F77=cf77
```

Or, if you prefer finer-grained control, you can add lines like the following to the top of any Makefiles that should use the Concurrent F77 compiler:

```
F77=cf77
```

The changes will then only affect the modified Makefiles. Note that this solution only works for Makefiles that use the default **.f.o** rules. If they contain hard-coded references to **f77** or **g77**, then the Makefiles must be changed to use  $\$(F77)$  instead. If the Makefile references anything like **g77** (Linux's GNU F77 compiler), then it will need to be changed, regardless.

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## 6.0. Changes in This Release

The following changes were made in Concurrent F77 Version 7.2.

### 6.1. Control-M (Carriage Return)

Source files may end in Carriage Return-Line Feed now instead of just Line Feed.

### 6.2. Support for Targeting AMD64

This release has support for AMD64 (a 64-bit processor supporting the x86\_64 instruction architecture). The installation CD (available separately from the PowerPC targeting compilers) contains both the i386 (32-bit) and the x86\_64 (64-bit) compilers. The installation script selects the appropriate one to install on the host machine. Cross targeting the 32-bit and 64-bit instruction architectures from one another is not supported, so the user should not manually install both compilers on a single machine.

AMD64 specific libraries are in `/usr/ccs/release/7.1/lib_amd64`. Pentium specific libraries are in `/usr/ccs/release/7.1/lib_ia32`.

### 6.3. INTEGER\*8 and LOGICAL\*8

Since the x86\_64 instruction architecture requires 8 bytes for storing pointers, the compiler has been enhanced to support 8-byte versions of the scalar types. All the compilers (i386, x86\_64, and PowerPC) now support these new types. The default size for INTEGER and LOGICAL remains four bytes in all compilers.

The existing intrinsics and I/O statements have been extended to support the new times, and two new intrinsics, %INT8 and %LOG8 have been added. See the man pages for details.

See “ASSIGN Statement” on page 11 and “POINTER Blocks” on page 12 for cautions regarding the ASSIGN statement and POINTER blocks.

### 6.4. -Qall\_variables\_in\_memory

This customer-requested option forces all variables to reside in memory.

#### **WARNING**

Since this suppresses holding variables in hardware registers, code quality will be significantly impacted.

This option may be helpful in debugging problems in user code, as it allows setting address traps on all variables.

## 6.5. Driver Restructure

The driver programs have been restructured so that all options are parsed before beginning the compilation. For example, you can now supply the `-c` option as the last option on the command line.

## 6.6. Passing COMPLEX by Value

Complex values passed with the `%VAL` intrinsic are now passed as though they were a C structure, consistent with the manual and with the Intel ABI. Previously, they were passed as two float variables. This may require some source changes.

## 6.7. `-Qcommon_underscore_count=N`

This customer-requested option allows the user to set the number of underscores appended to `COMMON` block names to 0, 1, or 2. The default is 2.

## 6.8. `END PROGRAM`, `END SUBROUTINE`, `END FUNCTION` and `END BLOCKDATA`

These new customer-requested keywords are aliases for the `END` statement closing a `PROGRAM`, `SUBROUTINE`, `FUNCTION`, or `BLOCKDATA` statement, respectively.

## 6.9. `-W` and `--pass_to_...` Options

Options were added to pass options to various sub-processors. Their syntax is:

```
-W{C|I|x|a|c|l|x|m|R|z}{,| }arglist  
--pass_to_cpp{=| }arglist  
--pass_to_f77{=| }arglist  
--pass_to_reorder{=| }arglist  
--pass_to_as{=| }arglist  
--pass_to_cc{=| }arglist  
--pass_to_linker{=| }arglist  
--pass_to_xref{=| }arglist  
--pass_to_m4{=| }arglist  
--pass_to_ratfor{=| }arglist  
--pass_to_analyze{=| }arglist
```

## 6.10. `-save-temps`

This option directs the compiler to not delete its temporary files.

## 6.11. Additional Filename Suffixes and Related Options

The **.FOR** filename suffix is an alias for the **.f** filename suffix.

The **.FPP** and **.fpp** filename suffixes are aliases for the **.F** filename suffix.

The **.S** filename suffix will preprocess assembly language files before passing them to the assembler.

The **.r.s** filename suffix will pass files to the **reorder** tool before being passed them to the assembler.

The **-x {c|assembler|assembler-with-cpp|f77|f77-cpp-input|ratfor|xref|reorder|none}** will override the the filename suffixes.

The **--stop\_before\_reorder** option will halt the compilation processes before invoking the **reorder** tool.

## 6.12. Use of '=' in *--option=argument*

Either '=' or ' ' (space) may be used to separate double-dash options from their argument.

## 6.13. -Qpower\_alignment

This option causes the compiler to set the alignments of bss and common segments to be the same as was generated for the PowerPC. Use of this option requires all source to be recompiled.

## 6.14. Code Quality Improvements

A number of code quality improvements have been made, especially in the areas of COMPLEX arithmetic and constant folding transcendental functions.

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## 7.0. Cautions

### 7.1. Byte Endian Issues

FORTRAN source code that makes assumptions about byte order may require modification to run on both PowerPC and Intel processors. Such dependencies usually occur in EQUIVALENCE statements, Hollerith constants, intrinsics that extract bits, and passing by reference wrong-sized integer variables to functions and subroutines.

For example, consider code that passes an `INTEGER*4` to a subroutine expecting an `INTEGER*1`. Since the parameter is passed by reference, on PowerPC the subroutine gets a pointer to the high-order byte of the parameter, but on Intel processors, the subroutine gets a pointer to the low-order byte of the parameter.

### 7.2. CPP

The FORTRAN compiler uses the system `cpp` tool. There may be subtle incompatibilities between `/lib/cpp` on PowerMAX OS and `/usr/bin/cpp -traditional` on Linux.

### 7.3. NaN

Programs that generate a Not a Number (NaN) may cause a signal when compiled for Intel processors where they do not on the PowerPC. This is because PowerPC allows a NaN to be loaded into a floating point register without generating a signal.

### 7.4. CALL Used on Floating-Point Functions

On Pentium, if the `CALL` statement is used to call a function that returns a floating-point value, the F77 compiler has no way of knowing that that function has pushed a value onto the floating-point register stack. This will usually result in a floating-point register stack overflow signal being raised.

On AMD64, the calling convention does not use the floating-point register stack, so this will not be a problem for that target.

### 7.5. Cross Compiling

Cross compiling from `x86_64` to `i386` or from `i386` to `x86_64` is not supported. The installation script will select the appropriate compiler. Do not manually install the inappropriate compiler.

### 7.6. ASSIGN Statement

On AMD64 (`x86_64`), the `ASSIGN` statement must still use the 4-byte `INTEGER` type for its target variable as this is required by the standard. In actuality, an unnamed 8-byte `INTEGER*8` shadows each `INTEGER` variable used as the target of an `ASSIGN` statement and by `GOTO` and I/O statements that use

ASSIGNED to INTEGERS. The standard allows this by prohibiting intermixing ASSIGNED uses of an INTEGER variable with arithmetic uses of the same variable. There is no way at this time to access the INTEGER\*8 shadow variable in the NightView debugger.

## 7.7. POINTER Blocks

On AMD64 (x86\_64), POINTER blocks must be based on INTEGER\*8 variables since pointers are 8-bytes. This is an unavoidable source incompatibility between the i386 and x86\_64 compilers.

## 7.8. Linking with gcc, g++ or g77

This release ships with its own updated linker (**ld**) that can interpret DWARF 3. If you link **cf77** generated code using the **gcc**, **g++**, or **g77** commands, they should be directed to use this alternative **ld**. This may be done by setting the **COMPILER\_PATH** environment variable to one of the following values:

```
COMPILER_PATH=/usr/ccs/release/7.2/lib_ia32
COMPILER_PATH=/usr/ccs/release/7.2/lib_amd64
```

for 32-bit Pentium code or 64-bit AMD64 code, respectively. It important that the correct path be chosen.

To make the **COMPILER\_PATH** effective for the duration of a shell invocation, it can be exported:

```
export COMPILER_PATH=...
```

Or the variable may be set for a single invocation:

```
COMPILER_PATH=... gcc ...
```

If the **COMPILER\_PATH** environment variable is omitted, the default system linker will be used; it will work on correct programs, but error diagnostics may be inaccurate.

The **cf77** command will use the alternative **ld** without requiring the user to set the **COMPILER\_PATH** environment variable.

## 7.9. DWARF 3

The debug information makes use of DWARF 3. As of this writing, **gdb** does not support this update to DWARF. NightView is required to debug code from this release.



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## 8.0. Direct Software Support

Software support is available from a central source. If you need assistance or information about your system, please contact the Concurrent Software Support Center at our toll free number 1-800-245-6453. For calls outside the continental United States, the number is 1-954-283-1822. The Software Support Center operates Monday through Friday from 8 a.m. to 5 p.m., Eastern Standard Time.

You may also submit a request for assistance at any time by using the Concurrent Computer Corporation web site at [http://www.ccur.com/isd\\_support\\_contact.asp](http://www.ccur.com/isd_support_contact.asp) or by sending an email to [support@ccur.com](mailto:support@ccur.com).





