GEMPACK USER DOCUMENTATION
Release 9.0

GPD-6
Installing and Using
the Source-Code Version of GEMPACK
on Windows PCs with Lahey Fortran

Installing and Using the Source-Code Version of GEMPACK on Windows PCs with Lahey Fortran

GEMPACK Document No. GPD-6

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Twelfth edition
April 2005

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Twelfth edition
April 2005

ISSN 1030-2514

ISBN 0-7326-1506-2

This is part of the documentation of the GEMPACK Software System for solving large economic models, developed by the IMPACT Project, Monash University, Clayton Vic 3800, Australia.

Abstract

Windows PC computers provide excellent platforms for doing serious general equilibrium modelling. This document describes how to install and use GEMPACK on a Windows PC provided it has the Lahey Fortran compiler LF90 or one of the Fujitsu/Lahey Fortran compilers LF95 or LF installed on it.

This document also describes how to install the Windows GEMPACK programs WinGEM, ViewHAR, ViewSOL, RunGEM, TABmate and AnalyseGE, and the electronic versions of the GEMPACK documentation.

Authors and Earlier Editions

Date	*Author(s)*	*Comment*
		[The first two editions of this were numbered GED-29.]
Feb 90	R.Walker, K.Pearson, G.Codsi	First edition (GED-29) [Release 4.1.01] [Title was "Installing and Using GEMPACK on PCs with Extended Memory".]
Sept 91	G.Codsi & K.Pearson	Second edition (GED-29) [Release 4.2.02] [Title was "Installing and Using GEMPACK on 386 DOS Machines with Extended Memory".]
Apr 93	J.Harrison & K.Pearson	Third edition (GPD-6) [Release 5.0] [Title was "Installing and Using GEMPACK on 80386 or 80486 DOS PCs with Lahey Fortran F77L-EM/32".]
May 94	J.Harrison & K.Pearson	Fourth edition (GPD-6) [Release 5.1]
Sept 96	J.Harrison & K.Pearson	Fifth edition (GPD-6) [Release 5.2] [Title now "Installing and Using GEMPACK on DOS, Windows or Windows 95 PCs with Lahey Fortran".]
Jan 97	J.Harrison & K.Pearson	Sixth edition (GPD-6) [Release 5.2] [Title now "Installing and Using the Source-Code Version of GEMPACK on DOS/Windows PCs with Lahey Fortran".]
Aug 97	J.Harrison & K.Pearson	Seventh edition (GPD-6) [Release 5.2-002]
October 98	J.Harrison & K.Pearson	Eighth edition (GPD-6) [Release 6.0]
April 99	J.Harrison & K.Pearson	Ninth edition (GPD-6) [Release 6.0-001]
October 2000	J.Harrison & K.Pearson	Tenth edition (GPD-6) [Release 7.0]
October 2002	J.Harrison & K.Pearson	Eleventh edition (GPD-6) [Release 8.0] [Title now "Installing and Using the Source-Code Version of GEMPACK on Windows PCs with Lahey Fortran".]
April 2005	J.Harrison & K.Pearson	Twelfth edition (GPD-6) [Release 9.0]

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CHAPTER 1

1 The Windows PC Source-Code Version of GEMPACK

This document GPD-6 tells you how to install the Source-Code version of GEMPACK on a Windows PC that has a Fortran compiler installed. Suitable compilers[1] are the Lahey compilers LF90, LF95 or LF.

By a "Windows PC" we mean a PC (usually a Pentium) running Windows 98, ME, NT, 2000 or XP.[2]

This document GPD-6 gives installation instructions about how to:

1. install the software from the GEMPACK CD,
2. run the program which builds the GEMPACK libraries and GEMPACK programs,
3. install the Windows GEMPACK programs (WinGEM, ViewHAR, ViewSOL, RunGEM, TABmate and AnalyseGE), and
4. install electronic versions of the GEMPACK documentation.

GPD-6 also covers machine-specific information relating to working with GEMPACK on a PC.

The user documentation for GEMPACK can be found in the other GEMPACK documents.[3] The GEMPACK document GPD-1 *Introduction to GEMPACK* should be your starting point. You can carry out the installation and testing of GEMPACK on a PC, as described below, without being familiar with GEMPACK. However, if you intend to use GEMPACK for modelling, we recommend you quickly read chapters 1 to 3 in GPD-1 before attempting any modelling on your PC.

An introduction to the different GEMPACK programs can be found in section 1.7 of GPD-1, while a guide to the models supplied with GEMPACK (including the Windows PC Source-Code version) is given in section 1.8 of GPD-1. A guide to the full user documentation for GEMPACK can be found in chapter 6 of GPD-1. Hands-on examples for GEMPACK can be found in chapters 2, 3 and 4 of GPD-1 and in GEMPACK document GPD-8.

The documentation for Release 9.0 of GEMPACK is in GPD-5. Section 1.3 of GPD-5 contains a guide to the Release 9.0 documentation.

1.1 Current Release

The current version of GEMPACK is Release 9.0 (April 2005).

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[1] The Fortran 77 Lahey compiler F77L-EM/32 is no longer supported for Release 8.0 of GEMPACK.

[2] For Release 7.0 or later, Windows 3.1 is no longer supported.

[3] References to GEMPACK documents identify the document by GEMPACK Document (GPD) number, rather than by author or date. References are always to the version of the document which is current at the date of issue of the cross-referencing document. The GEMPACK documents referenced are listed in a separate section at the end of the References section of this document. Comments from readers on this or any of the GEMPACK documents, either pointing out errors, inaccuracies, omissions or obscurities, or making other suggestions for improvements, will be welcomed. Please address such comments to one of the authors at the Centre of Policy Studies / Impact Project.

1.2 Contacting the Centre of Policy Studies / Impact Project

For more information about GEMPACK, contact

Professor Ken Pearson
Centre of Policy Studies and Impact Project
Monash University, Box11E,
Clayton VIC 3800,
Australia
email: Ken.Pearson@BusEco.monash.edu.au
Phone: (03)-9905-5484 or +61-3-9905-5484 from overseas
Fax: (03)-9905-2426 or +61-3-9905-2426 from overseas

Other information can be obtained from the GEMPACK Web site:

http://www.monash.edu.au/policy/gempack.htm

CHAPTER 2

2 System Requirements for Installing GEMPACK

Most current Windows PCs easily satisfy the minimum requirements, which are spelled out in section 2.1 below.

For the Source-Code Version of GEMPACK you also need one of the supported Fortran 90 compilers – see section 2.3 for details.

Most current Windows PCs have at least 256Mb of RAM. Many models can be solved with that amount of memory, though more memory is needed for very large models.

2.1 Summary

For the Source-Code Version of GEMPACK, you must have at least the following.

1. A Pentium computer, or similar Windows PC.
2. Windows 98, Windows ME, Windows NT, Windows 2000, Windows XP.[4]
3. Hard disk, requiring at least 100 MB free to install and test GEMPACK.
4. At least 128 MB of memory (RAM).
5. A suitable Fortran 90 compiler: the Lahey Fortran 90 compiler LF90, or either of the Fujitsu-Lahey compilers LF95 or LF. **Note that the compiler MUST be installed on your machine BEFORE you install GEMPACK.**

Most modern computers easily satisfy the first four requirements. If you feel uncertain about some of these requirements and wish to check them, see the details in sections 2.1.1 and 2.2 below.

More information about the Fortran compilers can be found in section 2.3 below. We give advice about installing your Fortran compiler in section 3.1 below.

2.1.1 Disk Space Free

You can determine how much disk space is free by:

1. in Windows, right click on the icon for your hard drive in "My Computer" or
2. in a DOS box, entering the DOS command: **dir**
   The number of bytes free is shown on the screen at the end of the output. (1Mb is about a million bytes, so you will need about 100,000,000 bytes free to install, test and use GEMPACK.)

Implementing your own models takes more disk space. As you would expect, the larger the model, the more space you will need.

2.2 Memory Required

The amount of memory you have limits the size of models you can build. Our experience is that many models that are being built now can be implemented with 128 MB of RAM.

Recent versions of Windows such as Window XP use more memory. For MSOffice with Windows XP, the Microsoft "Minimum Requirement" is "128 MB of RAM plus an additional 8 MB of RAM

[4] Windows 95 may be satisfactory. For Release 7.0 and later, Windows 3.1 is no longer supported.

for each Office program (such as Word) running simultaneously." Bear in mind that to do useful things with GEMPACK, you'd very often need to have an MSOffice application open at the same time.

Click on **Help | About** in the main menu of **My Computer**. This will tell you how much physical memory is available to Windows.

2.3 FORTRAN Compilers

As with Release 8, we only support two Fortran compilers on Windows PCs. The two supported (both are produced by Lahey Computer Systems) are:

LF90. We support only the final version 4.50i. [If you have an earlier maintenance update of version 4.50 – for example, version 4.50c – you should go to the Lahey web site http://www.lahey.com and download (there is no cost) the final maintenance update for LF90 which is version 4.50i.][5]

LF95. We support only versions 5.60 and later. On the Lahey web site, versions 5.60 and 5.70 are referred as **Lahey/Fujitsu Fortran 95** while versions 7.0 and later are referred to as **Lahey/Fujitsu Fortran** (95 is not added) or just **LF Fortran**.

- The final maintenance updates for versions 5.60 and 5.70 are versions 5.60h and 5.70f respectively. [If you have an earlier maintenance update of version 5.60 or 5.70 – for example, version 5.60d – you should go to the Lahey web site http://www.lahey.com and download (there is no cost) the final maintenance update for your version.]
- Any of the versions of LF (the current ones are versions 7.0 and 7.1) are suitable. However, you should go to the Lahey web site to download and use the latest maintenance update for your version.

We sometimes use LF95 in this document to refer to both LF95 and the more recent LF.

There are various different grades of Fujitsu/Lahey LF95 and LF compilers available. If you are just using LF95 or LF for GEMPACK, you can use the least expensive one called **LF95 Express** or **LF Express**. If you are developing programs in Fortran as well and need to debug programs, you may wish to buy Standard LF95 or LF95 Pro.

If you are buying a new compiler we recommend LF.

With versions of GEMPACK prior to Release 8.0, it was possible to use Lahey Fortran 77 compiler F77L-EM/32 compiler that is called F77L3. However for Release 8.0 (or later) this F77L3 computer is **no longer supported**. This is because the compiler F77L3 satisfies the Fortran 77 standard (1977), and consequently, F77L3 does not have modern facilities available such as allocatable arrays and support for long filenames that may contain spaces. Also F77L3 does not work with recent Windows versions such as Windows XP.

If you are currently using F77L3, we recommend that you update to LF.

If you are currently using LF90, there is no need to upgrade to LF.

Contact Lahey at	Lahey Computer Systems Inc PO Box 6091, Incline Village, NV 89450, USA Website : *http://www.lahey.com* Telephones: +1-800-548-4778 or +1-702-831-2500 FAX: +1-702-831-8123
The Australian agent is	Devin Trussell Computer Transition Systems Box 4553, Melbourne 3001

[5] Note that you cannot use Essential Lahey Fortran 90 (ELF 90); you must use the full LF90 compiler.

Website: *http://www.cts.com.au*
Email: *info@cts.com.au*
Telephone : (03) 9530-6633 or +613-9530-6633 (overseas)
FAX: (03) 9530-6644 or +613-9530-6644 (overseas)

2.3.1 Lahey or Fujitsu Files

Binary files (most importantly, GEMPACK Header Array files – see section 3.1 of GPD-4) produced by LF90 programs are referred to as **Lahey** Files. We refer to the files produced by LF95 and LF as **Fujitsu** files to distinguish them from Lahey files.

Binary files produced by LF95 or LF programs cannot be read directly by programs compiled and linked using LF90. Similarly, binary files produced by LF90 programs (or previously by F77L3 programs) cannot be read directly by programs compiled and linked using LF95 or LF.

However

- we supply with GEMPACK tools that allow you to convert binary files of one of these types to the other type.
- GEMPACK programs can read binary files of either type, by converting the file to a temporary file of the correct type for your compiler.

See chapter 15 of GPD-4 for details.

As an example, suppose you are working with LF95. The GEMPACK installation contains files of both types and will install Fujitsu files appropriate for LF95. Files made by your simulations will be Fujitsu files. However if you receive a Lahey file from someone else who uses the LF90 compiler, GEMPACK programs can read it. Or you can convert it to a Fujitsu file by using the conversion program (CONLF or ConvHAR – see section 15.1 of GPD-4) if you wish to use it extensively.

Note however that GEMPACK programs from Release 6.0 or earlier cannot read Fujitsu files. These files must be converted first to Lahey files, following the procedures described in chapter 15 of GPD-4.

More details about this topic can be found in chapter 15 of GPD-4.

CHAPTER 3

3 Installation Instructions

Source-code GEMPACK is usually supplied on a CD. If you do not have a CD drive on your computer, see chapter 8.

The components to install are:

- the Source-code version of GEMPACK.
  This involves copying the Source-code files from the CD (or disks), and building libraries and executable images of the various GEMPACK programs.
- the GEMPACK licence file plus any bug fixes.
- Windows GEMPACK programs including:

WinGEM	the Windows interface to GEMPACK.
ViewHAR	used to view and modify data on GEMPACK Header Array files.
ViewSOL	used for viewing Solution files (results of simulations).
GemEdit	a text editor used by WinGEM.
RunGEM	used for carrying out simulations with models and doing sensitivity analysis.
TABmate	an editor for modifying and debugging TABLO Input files.

  You can choose to install only some of these programs. However we would recommend that you install all the Windows GEMPACK programs.

- AnalyseGE, the Windows program used for analysing simulation results.
- electronic versions of the GEMPACK user documentation (PDF files).
  You can read or print this GEMPACK documentation using the Adobe Acrobat Reader (which you can also install from the Source-code CD if it is not already installed on your computer).

After some preliminaries, instructions for installing the Source-code version of GEMPACK are given in sections 3.5 to 3.10 below. Instructions for installing WinGEM and associated Windows programs are given in section 3.5.1 below. Instructions for installing AnalyseGE are given in section 3.5.2 below. Instructions for installing the GEMPACK documentation are given in section 3.5.3 below.

3.1 Installing your Fortran Compiler

Before installing GEMPACK, install your Fortran compiler LF90, LF95 or LF.
Select a *typical installation* for LF90, LF95 or LF.

If you change your compiler, for example from LF90 to LF95, you need to reinstall the Source-code files again from the CD or disks. There are some different files used for the different compilers.

3.1.1 Set the Environment Variable TMP

The two compilers LF90 and LF95 use the directory set by the TMP Environment variable to write temporary files while compiling and linking. If this directory contains a space or non-English characters, the compiler will not work and stops with an obscure message.[6]

Make sure your Environment variable TMP is set to some simple short directory (for example C:\TEMP) or similar.

- **If you are running Windows 2000 or XP**

You can right-click on "My Computer" and select "Properties | Advanced | Environment Variables"

and then edit the User Environment variable called TMP to be C:\TEMP.

Create a new folder C:\TEMP if you do not already have one.

- **If you are running Windows NT**

You can right-click on "My Computer" and select "Properties | Environment Variables"

and then edit the User Environment variable called TMP to be C:\TEMP.

Create a new folder C:\TEMP if you do not already have one.

- **If you are running a different version of Windows (eg Windows 95, 98 or ME)**

You need to change your AUTOEXEC.BAT file. For example, put the line

```
set TMP=c:\temp
```

to set TMP to point to directory c:\temp. [Make sure that the only space in this line is the one between ""set" and "TMP".] You need to reboot after making a change to AUTOEXEC.BAT.

3.2 If You Have An Earlier Release of GEMPACK Installed

If you have an earlier release of GEMPACK installed on your machine, when installing Release 9.0, you can either choose to leave the earlier version on the disk or to first remove the earlier version. Indeed, it is probably best (if you have enough disk space) to leave the earlier version on the disk until you have successfully installed and tested Release 9.0 (in case an unexpected problem occurs). This means installing Release 9.0 of GEMPACK in a different directory from the one in which you installed the earlier release.

If you decide to keep the existing version while installing Release 9.0, you can change the name of the directory it is in using *My Computer* or *Windows Explorer*.

For example, if your GEMPACK directory is currently the default GEMPACK directory C:\GP, you can rename your current GEMPACK directory if you want to save it (for example, to C:\GP90) and then use the default directory C:\GP as the GEMPACK directory. Installing in the same directory means that you do not have to tell the Windows programs such as TABmate and RunGTAP where the Release 9 GEMPACK programs are installed, as described later in section 3.9.3.

---

[6] LF90 or LF95 produces the compiler error "ABORT -- Cannot recognize command line".

3.3 Installing Under Windows on a PC

You will install and build GEMPACK libraries using the Windows installer supplied with the Source-Code CD. The installation procedure is described in detail in sections 3.5 to 3.10 below.

3.3.1 Security and Permissions

Recent Windows versions such as Windows 2000 and XP have introduced different User Accounts and different grades of Users. The simplest way of operating your computer is when you are the sole user of your computer and have full Administrator/Power User rights when using it to run GEMPACK.

To install GEMPACK, you may need Administrator or Power User privileges. Otherwise, the installer will be unable to change the PATH variable as part of the install procedure.

If you have installed GEMPACK as Administrator, you need to set the permissions so that ordinary Limited or Standard users can access the files. They need to be able to read and execute the programs in the GEMPACK directory (see section 3.5). In their working directories, Limited Users need full rights to read, write, execute and delete files.

Under Windows XP, you may find that, if one user has copied files to a directory for use by another user, the files "belong" to the first user and can not be deleted by the second user. If the second user tries to write to a file of the same name as one belonging to the first user, the write fails because the GEMPACK program is unable to delete the old file before creating a new version with the same name.

3.4 If You Are Installing on a Network

If you are installing GEMPACK on a network, please read chapter 7 before proceeding.

In particular, if your Fortran compiler is installed on a network, you should make the changes in points (i) and (ii) in chapter 7. If you change your AUTOEXEC.BAT file, reboot your computer before continuing.

You can copy all the files from the GEMPACK Source-code CD onto one machine on the network and use the files so copied to install on other machines (including those without a CD drive) attached to the network. See section 8.1 for details.

3.5 Installing from the Source-Code CD

Source-Code GEMPACK is supplied on a CD. Insert the CD into your CD drive. Exit from other Windows programs you may have running on your PC. Then select from the **Start Menu**

Run…

and enter in the RUN box,

e:\install.exe (Replace **e:** by the drive letter for your CD – for example, **f:\install.exe**)

After this just follow the install procedure. If you are not sure, read the information below which gives a few more details.

Selecting What to Install

You are first asked to select which components you wish to install. You can select some or all of

- Source-Code GEMPACK (including executable images)
- Files from GEMPACK licence (and fix) diskette
- Windows GEMPACK files (WinGEM etc)
- GEMPACK documentation (PDF files)
- AnalyseGE files

Click in the check boxes to indicate which you want to install[7]. Then click on **Ok**.

The first option above means copying the Source-code files from the CD and then building libraries and executable images of the various GEMPACK programs.

If you have been provided with a new GEMPACK licence, it will be supplied on a disk (not on the CD). If you have checked the first item above, you should also check the second item above so that your new licence is copied to your computer as part of the installation procedure. If reading from a floppy diskette is a problem[8], do not check the second item. You can copy the licence file later as described in section 3.10.

If the letter sent with your CD indicates that there is a bug fix disk included, you should check the first two items above so that these bug fixes are incorporated into the version of GEMPACK you install.

Selecting the GEMPACK directory

Then you are asked to select the folder (another name for "directory") in which to install the relevant components. The default is the directory **C:\GP**. We suggest that you install in this default directory unless you have another version of GEMPACK already there. In that case, perhaps choose directory **C:\GP90**. However you can choose any directory you please.[9]

---

[7] Disk space needed by the various choices is shown in brackets since the main installer can not estimate the sizes of the files involved.

[8] For example, some computers can have a CD or alternatively a floppy disk drive but not both at once. In this case copy the licence file later.

[9] The compilers LF90 and LF95 can handle long file names and directory names, and names containing spaces. However these compilers do not handle non-English characters. See sections 5.9 and 5.9.3 in GEMPACK document GPD-1 for details.
If you are using LF90, you must not put a hyphen "-" in the name of the directory in which you install GEMPACK. [If you do, LTG (see section 1.2 of GPD-2) fails because LF90 interprets the "-" as indicating a compiler option. The error message is "ABORT – Unrecognized option in command file".]

To choose another directory , click on the **Browse** button. Select the directory or type in the name of a new directory. The directory need not exist since the installer will create it for you. Indeed it may be best to choose a directory that does not already exist since, otherwise, the installation procedure may overwrite existing files. Then click on **Ok**. Check carefully that the name of the directory is what you want since the installer is inclined to add \GP to the directory name selected.

Below we refer to this directory, where you are installing GEMPACK, as the **GEMPACK directory**. [Click on **Next** once you have selected the directory.]

Changes to your PATH and Environment ?

Then you will be asked if you wish the Install program to make relevant changes to your PATH and the Environment variable called GPDIR. Details about these changes can be found in section 3.9 below. We recommend that you
respond **yes** if you are installing Source-Code GEMPACK in a new directory, but recommend you respond **no** if you are installing Source-Code GEMPACK in the same directory that contained an earlier version of GEMPACK.

If you are using Windows NT or 2000 or XP, the installer will carry out the changes to your PATH and GPDIR using the Windows registry.[10] If you are using Windows 95, 98 or ME the installer will change your AUTOEXEC.BAT file. If you prefer to make these changes yourself, say **no** and see section 3.9 about how to change your PATH and set GPDIR.

Which Fortran Compiler (LF90, LF95 or LF) ?

If you are installing some of the Windows GEMPACK files or AnalyseGE, you will be asked whether you are using the LF90 or the LF95 compiler. [This choice is necessary because of the different formats of binary files that these compilers use – see section 2.3.1 for details.]

Answer **yes** if you are using the Lahey LF90 compiler.

Answer **no i**f you are using either of the Lahey-Fujitsu compilers LF95 or LF.

Installing

The Install program then begins to install the components you have selected.[11] These are done in the following order.

- Windows GEMPACK files (WinGEM etc) [if selected]
- AnalyseGE files [if selected]
- GEMPACK documentation (PDF files) [if selected]
- Source-Code GEMPACK (including executable images) [if selected]
- Files from GEMPACK licence (and fix) diskette [if selected]

[This order is chosen because the first three above are installed relatively quickly while installing Source-Code files and building libraries and executable images may take considerably longer.]

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[10] This is new for Release 8.0 of GEMPACK. Previously we recommended that you carried out these changes yourself by changing the Environment page of the System Properties to add the GEMPACK directory to your path and set a new Environment variable GPDIR to point to the GEMPACK directory (see section 3.9.1). Under Windows NT, 2000 and XP, the GEMPACK Release 8.0 installer will
(i) add the GEMPACK directory to your system Path, which will affect all users (you need Administrator privileges to do this),
(ii) set GPDIR only for you (not for other users). [If others use GEMPACK on your PC, they may need to set GPDIR.]

[11] The components are separate installs under the main install program so if you cancel out of one, the main installer will go on to the next in the series.

Leave the CD in the CD drive until the installation is complete.

3.5.1 Installing WinGEM and Related Windows Programs

Follow the prompts and install the Windows GEMPACK files in your GEMPACK directory. You can choose to install just some of these programs but we would recommend that you install all components.

You will be told when the installation of these files starts. It takes the installer only a few seconds to copy the relevant files into the directory you have chosen. The installer also creates icons for the various programs (WinGEM, ViewHAR, ViewSOL, RunGEM, GemEdit and TABmate) on your desktop.

3.5.2 Installing AnalyseGE

You will be told when the installation of AnalyseGE starts.

We recommend that you install AnalyseGE in your GEMPACK directory (but you can use a different directory if you wish). (Note that the name of the EXE file for AnalyseGE is ANALYSGE.EXE.) The installer will create an icon for it on your desktop.[12]

3.5.3 Installing the GEMPACK Documentation

You will be told when the installation of these files starts. Install them into your GEMPACK directory or into some other directory if you prefer. Again it takes the installer only a few seconds to copy the relevant files into the directory you have chosen. The electronic versions of the GEMPACK documentation installed are so-called **PDF files**.[13] These can be viewed or printed with the **Adobe Acrobat Reader**. The installer asks if you want this Acrobat Reader installed. We recommend that you only say **Install** if you do not have any version of this Reader on your PC (otherwise say **Cancel**).

If you choose to install the Adobe Acrobat Reader, the Adobe installer will be run. The installer may take a minute or so to check your computer before beginning the installation. If the Adobe installer suggests rebooting your computer, we suggest that you say **no** so that you complete the other installations first.

3.5.4 Copying Source-code Files and Building Libraries and Executable Images

You will be told when this part of the installation starts. First the GEMPACK installer **BuildGP** (see section 3.6) is installed onto your PC. Then BuildGP starts running. You direct it to copy the source-code files from the CD and then start building the GEMPACK libraries and executable images of the various GEMPACK programs. To do this, work through sections 3.6 to 3.8 below.

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[12] See section 2.6 of GPD-4 for further details about AnalyseGE. See chapter 6 of GPD-8 for a hands-on introduction to the use of AnalyseGE.

[13] PDF is an abbreviation for "Portable Document Format".

3.6 Running BuildGP

The program **BuildGP** is designed to carry out the following tasks:

1. Copy the GEMPACK files from the GEMPACK Source-Code CD or the four Source-code diskettes to the directory on your hard disk where you want to install GEMPACK (often C:\GP).
2. Either make changes to your Registry or AUTOEXEC.BAT to add this GEMPACK directory to your path (with your permission) or indicate what changes need to be made.
3. Check your system to see if Fortran is installed, if there is enough disk space, whether the licence is in the correct place, and check the DOS path.
4. Make the GEMPACK libraries by compiling many groups of subroutines.
5. Make the GEMPACK programs (executable images) by compiling the programs and linking to the libraries.

You need not do all these tasks in one go. If you need to, **you can exit** from BuildGP **and restart** it again later to complete the installation of GEMPACK (see section 3.7.1).

When BuildGP starts to run, it offers you two choices.[14]

- Copy files from the installation CD
- Build libraries and executable images.

Click on the first of these ***Copy files from the installation CD*** and then click on the ***OK*** button. Then continue with section 3.7 below.

3.7 Copying the Files from the Installation CD

Next you are asked which version of Fortran you will use. Either click on one of

- ***LF90***
- ***LF95***

and then click on the ***OK*** button. [If you are using the LF compiler, select the LF95 option.]

Then you are asked to specify in **which directory** you wish to install GEMPACK. The default offered is the target directory selected in installing the program BuildGP in section 3.5. Normally you should accept the default (but you can choose another directory if you wish to). The directory you choose here is what we call the GEMPACK directory (see section 3.5).

The installer will ask you to confirm the name of the drive containing the CD. Click ***OK*** (after changing the name of the drive if necessary). BuildGP will copy the files from the CD onto your hard disk.[15]

If you checked "Files from GEMPACK licence (and fix) diskette" as one of the components to install (see section 3.5 above), you will now be asked to insert the licence and fix diskette into your floppy disk drive. You will also be asked to indicate the name of the relevant drive (A:, B: etc). The installation procedure will copy your licence file and also make any bug fixes contained on the

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[14] If you are installing from disks, these choices are:
- Copy files from the installation diskettes
- Build libraries and executable images.

[15] If you are installing from the four floppy disks, you will be asked to insert the GEMPACK disk number 1 into your floppy drive. You must also specify the name of this drive (for example, **B:**) if it is not **A:**. Once the disk is inserted, click on ***OK***. BuildGP will copy the files from this disk onto your hard disk. Repeat for the remaining disks 2, 3 and 4.

diskette. [This will probably take a little longer that it took to copy the GEMPACK documentation from the CD.]

This completes the copying of files. Now we suggest that you continue in BuildGP to build the GEMPACK libraries and make executable images of various of the GEMPACK programs (as described in the section 3.8 below). However if you wish to, you can exit from BuildGP at this stage and restart it as described in section 3.7.1 below when you are ready to build the libraries and programs.

3.7.1 If You Need to Restart BuildGP

If you have used BuildGP to copy the files to your hard disk (as in section 3.7), but were not able to complete building the libraries and executable images (see section 3.8 below), you need to restart BuildGP to do that.

Find the program BUILDGP.EXE in the GEMPACK directory in *My Computer* or *Windows Explorer*. Double click on BUILDGP.EXE to start it running.

When BuildGP starts to run, click on the option ***Build libraries and executable images***, and then click on the ***OK*** button. Then proceed as in section 3.8 below.

3.8 Building Libraries and Executable Images

(a) If you have just finished the section 3.7, and are still running BuildGP, check that the compiler and GEMPACK directory are as you expect.

(b) If you have just re-started BuildGP running, after selecting *Build libraries and executable images*,

1. check carefully that the directory containing the source-code GEMPACK files is correct. If not, use the ***Browse*** button to select the directory you want to use.
2. The correct compiler (LF90 or LF95) should be selected automatically. [If not, please select the one you wish to use.]

Now (in either case (a) or (b) above), click on the ***Start build*** button. BuildGP will go through the various steps to build libraries and executable images. This will take several minutes (perhaps somewhere between 10 and 30 minutes depending on the speed of your machine). If all goes well, you will eventually see a message saying that the libraries and images have been built successfully. In that case, just click ***OK*** and note the next information before BuildGP exits, and then go on to section 3.9.

3.8.1 If an Error Occurs

If an error occurs during this build process, you will be told the name of the procedure when the error occurred. We suggest that you note this name on paper, then exit from BuildGP.

Usually an Error log is shown. This contains the last few lines on the screen before the error occurred. This may give you some idea as to what is happening.

Possible Checks and Actions to try:

1. Check that there is plenty of room on your hard disk.
   [If not, you will need to delete some files to create space.]
2. Check that Fortran is installed and on your path. For example, at the DOS prompt, type in LF90 or LF95 and see if you get some output from your compiler about Usage.
3. Check that the TMP environment variable is set properly as described in section 3.1.1.
4. Then reboot your computer.

5. When it restarts, start BuildGP running.
6. Then indicate that you want to build libraries and images.
7. Check the GEMPACK directory (it should be the one you want - otherwise use ***Browse***). Note that while the compilers LF90 and LF95 can handle long file names, they do not support directory names containing Chinese or other non-English characters. See sections 5.9 and 5.9.3 in GEMPACK document GPD-1 for details.
8. Then select ***Options*** in the BuildGP menu bar and then select ***Continue from previous build*** from under the ***Options*** menu. This should start right into the place where the previous error occurred.
9. If the error does not re-appear, continue with the build. If it reappears, please notify us at the Impact Project. If an Error log has been created, please send it with details of what happened.

There are some checks built into BuildGP which check the amount of **disk space** which is free on the drive you have selected for the GEMPACK directory. You can override these checks if you disagree or you can exit from BuildGP, clear some more disk space and then restart BuildGP to continue the build.

3.9 After A Successful Build, Fix the PATH and GPDIR

For GEMPACK to run easily, you must make sure that the GEMPACK directory (usually C:\GP) is on your PATH, and that the Environment variable GPDIR is set to the GEMPACK directory.

If you allowed the Source-code installer or BuildGP to make changes to your PATH and the Environment variable GPDIR (see section 3.5 above), this has already been done. If you are using Windows 95 or 98 or ME and you made changes to your AUTOEXEC.BAT file, you just need to **restart your computer** now. This will complete the main part of the installation of GEMPACK. Once your computer restarts, you can go on to go to section 3.10 below.

If you did not allow the Source-code installer or BuildGP (as appropriate) to make changes to your PATH and GPDIR (see section 3.5 above), you must make the required changes yourself. Instructions for making these changes are given in section 3.9.1 below if you are using Windows NT, 2000 or XP, or in section 3.9.2 below for Windows 95, 98 or ME.

3.9.1 PATH and GPDIR for Windows NT, 2000 or XP

If you are using Windows NT or 2000 or XP, the usual method to change the PATH and set the Environment variable GPDIR is by editing the System Properties – see steps 1 to 4 below. This has the advantage that you do not need to reboot your computer afterwards.

The important changes are that

- the directory into which you installed GEMPACK must be on your DOS path.
- if this GEMPACK directory is not C:\GP, the DOS environment variable GPDIR must be set equal to the GEMPACK directory.

If you allowed the installer to make these changes, you can check that this has been done correctly using the steps 1 to 4 below. If you did not allow the installer to make these changes, carry out the following steps 1 to 4.

1. Right click on *My Computer*.

   For Windows 2000 or XP, select *Properties* | *Advanced* | *Environment Variables*

   For Windows NT, select *Properties* | *Environment Variables*

2. Select the *Path* variable and add the GEMPACK directory to it (separated by a semicolon ;). You can add the GEMPACK directory to the beginning or end of the current PATH as you prefer. [If you have a previous GEMPACK directory on your Path, replace it with the new GEMPACK directory.] Click on the *Set* button to accept this change. Check that the directory containing the Fortran compiler is also on the PATH. If not, add this directory (for example, C:\LF9045\BIN for the LF90 compiler.)
3. Set a new Environment variable named GPDIR and give it a value C:\GP90 (or whatever your GEMPACK directory is called.) Select the *Set* button to accept this change.
   Note that if you have installed GEMPACK in the default directory C:\GP, it is not necessary to set the Environment variable GPDIR. The GEMPACK programs will assume that C:\GP is the GEMPACK directory, which contains your GEMPACK licence and the GEMPACK libraries and programs, if GPDIR is not set.
4. Click on the *Ok* button to accept these changes to the Environment.

These changes will take effect when you next start Windows programs or open a new DOS box.

Test these changes by opening a new DOS box and entering "SET". This should show the altered path and the new Environment variable GPDIR.

3.9.2 PATH and GPDIR Changes in AUTOEXEC.BAT (Windows 95, 98 or ME)

If you are using Windows 95, 98 or ME, the usual method is to use AUTOEXEC.BAT. The installation program may have already made the changes to AUTOEXEC.BAT (with your permission – see section 3.5 above). In that case you must **restart your computer** for the changes to take effect.

If you prefer to make changes to AUTOEXEC.BAT yourself, AUTOEXEC.BAT is a text file in the directory C:\ of your computer. You must edit it in a text editor.

The important changes to AUTOEXEC.BAT are that

- the directory into which you installed GEMPACK must be on your DOS path.
- if this directory is not C:\GP, the DOS environment variable GPDIR must be set equal to this directory.

Once you have made these changes, you must **restart your computer** before proceeding. Examples of these changes are given in section 3.9.2.1 below.

3.9.2.1 Example of Changing PATH and GPDIR in AUTOEXEC.BAT

You have installed GEMPACK in a directory on your hard disk. The default directory name for the GEMPACK directory is **C:\GP.** However you may have chosen some other directory name in section 3.5 above. For this example we will assume you have used C:\GP90.

If you have not allowed the installer to make changes to your AUTOEXEC.BAT, you must edit the appropriate file (called AUTOEXEC.BAT in your default directory C:\) which is executed when you turn on your PC. (If you have no such file, create one.) You should add these directories to the PATH line in that file. (Use a text editor, such as the editor EDIT which comes with DOS, or GemEdit or TABmate.)

For example, if you find a line

```
PATH = C:\;C:\WINDOWS
```

you should change it to

```
PATH=C:\;C:\WINDOWS;C:\GP90;C:\LF9045\BIN            (if using LF90 Version 4.5)
PATH=C:\;C:\WINDOWS;C:\GP90;C:\LF9557\BIN            (if using LF95 Version 5.7)
```

Note that it is important not to include any spaces in these lines.

If you do not find a PATH line, make a new line

```
PATH=C:\GP90;C:\LF9045\BIN                          (if using LF90 Version 4.5)
PATH=C:\GP90;C:\LF9557\BIN                          (if using LF95 Version 5.7)
```

(If you installed GEMPACK on a disk drive different from C:, specify that one in the PATH line.) Do not leave any spaces in the PATH line.

If you installed the GEMPACK files in directory C:\GP, no other change is required to AUTOEXEC.BAT. But if you installed these files in another directory, you need to add an extra line to AUTOEXEC.BAT. For example, if you installed the GEMPACK files in directory C:\GP90, add the following line:

SET GPDIR=C:\GP90

(Change this appropriately to indicate where you actually installed these files.) Note that it is important not to include any spaces in this line, apart from the one between SET and GPDIR.

3.9.3 If You Installed in a New Directory (not C:\GP)

This section does not apply if you have installed GEMPACK in the standard directory C:\GP. It is only relevant if you have installed Release 9 of GEMPACK in a directory which is different from the directory in which you installed your previous version (probably Release 8) of GEMPACK.

You may need to help some windows programs to find and use the Release 9 GEMPACK programs. We give the main examples below.

TABmate. You will need to tell TABmate where to find the Release 9 version of TABLO.EXE. To do this, go to the **Code and other** menu item under the **Options** menu. Then click on the **Change** button in the **Location of TABLO.EXE** part of the form and find the Release 9 version of TABLO.EXE.

RunMONASH and **RunDynam**. Click on the **Options** menu and use menu items such as **Which ViewSOL to use** to tell the program which versions of ViewSOL, ViewHAR and AnalyseGE to use.

RunGTAP. Click on ***Tools..Options*** and then use the various **Change** buttons to tell RunGTAP where to find the Release 9 versions of Gemsim, ViewHAR, ViewSOL, TABmate, AnalyseGE, Tablo etc.

3.10 GEMPACK Licence

Your GEMPACK licence must be called LICEN.GEM and it must be placed in your GEMPACK directory (that is, the directory in which you installed GEMPACK).

If your GEMPACK licence file has been sent on a disk (a floppy disk accompanying the CD), the file LICEN.GEM on that disk will have been copied to your GEMPACK directory as part of the installation process.[16]

If you already have the licence on your computer in another directory, please copy the file LICEN.GEM to your current GEMPACK directory.

If you do not have a floppy disk drive on your computer, you will need to find an old computer with a floppy disk. Copy the licence file from the floppy disk (LICEN.GEM) onto something that your computer can access, for example, a Flash disk in a USB port, a zip disk, a CD or the network. We will be happy to send you the licence file by email if you have problems. Contact GEMPACK as described in section 1.2.

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[16] That will happen if you checked "Files from GEMPACK licence (and fix) diskette" as one of the components to install – see section 3.5. Otherwise you must copy the file yourself.

Please see section 1.2 of GEMPACK document GPD-5 for details about GEMPACK licences for Release 9.0.

The types of GEMPACK licences for Release 9.0 are the same types as for Release 8.0 and 7.0 but are different from Release 6.0 licences. Release 7.0, 8.0 and 9.0 licences can be used with Release 6.0 programs.

3.11 Applying a GEMPACK Fix

This section is relevant only if the letter sent with your software says that there is a **bug fix disk** included.

Usually the separate disk sent with your CD will just contain your GEMPACK licence file LICEN.GEM. However, if there are bug fixes, they will be on the licence disk.

If you are installing from CD, it is safest to apply GEMPACK fixes as part of the normal install process from the GEMPACK Source-Code CD as described in section 3.5. This method means that you install GEMPACK again from the CD and then apply the fix. This ensures that the GEMPACK files are as expected before the fix is applied.

3.12 Copying GEMPACK Programs to Other PCs

If you have a GEMPACK site licence, you are entitled to copy GEMPACK programs to PCs covered by your site licence, for example, within the same department or institute.

You should note that the GEMPACK programs TABLO and GEMSIM require a GEMPACK licence. Accordingly, under the terms of your GEMPACK licence, you must not copy (or send copies of) executable images of these to machines outside the site which is covered by your GEMPACK licence.

You are allowed to send copies of the other GEMPACK programs, including TABLO-generated programs, outside of the site covered by your GEMPACK licence. However, you should note that

- TABLO-generated programs may require an Introductory licence if they are used with a large model - see section 1.9.5 of GPD-1.
- SAGEM.EXE requires at least an Introductory GEMPACK licence to solve larger than medium-sized models (see section 6.3.3 of GPD-7).

Of course you must not send a copy of your GEMPACK licence outside the site covered by your licence.

3.12.1 Windows Programs

Anyone (with or without a GEMPACK licence) is entitled to download and install the GEMPACK Windows programs from the GEMPACK web site (see section 1.3 of GPD-1). However a GEMPACK licence may be required to work with larger than medium-sized models. See the Help files for the various programs for details.

The versions of these programs may be updated between GEMPACK Releases. You can check on the GEMPACK web site to see if updates are available. Note that there are separate installs for AnalyseGE and for the other Windows programs.

3.13 Accessing the CoPS Web Pages from the CD

The GEMPACK CD also contains a recent snapshot of the Centre of Policy Studies (CoPS) Web site at Monash University. It is created as a convenience for those who do not have easy or rapid Internet access. Please be aware that the real Web site may well have been updated since this CD was created. The real web address is *http://www.monash.edu.au/policy*

To access this snapshot of the web site, you do **not** have to be connected to the Internet. However, you do need a Web Browser, such as Netscape or Internet Explorer. Enter the location:

e:/welcome.htm where "e" is the drive letter of your CD drive.

Links pointing to sites outside the Centre of Policy Studies, and *mailto* links have been preserved, but will only function if you are connected to the Internet.

Included in the CoPS Web pages are PDF versions of many of the CoPS/Impact Project Working papers which you can read or print out using the Acrobat reader. A self-extracting EXE archive is included in the ACROBAT directory on the CD for those who do not have the Acrobat reader. You can copy the EXE to your hard drive and run it to install the Acrobat Reader.

3.14 Uninstalling GEMPACK

To uninstall GEMPACK from your computer, carry out the following steps:

1. Delete all the files in the directory containing GEMPACK and its subdirectories. Then remove this directory.
2. For Windows NT, 2000 or XP, remove the changes to your PATH and environment made in section 3.9.1. For Windows 95, 98 and ME, remove the lines in your AUTOEXEC.BAT which add the GEMPACK directory to your path, and remove the SET GPDIR=... statement from AUTOEXEC.BAT.

If you are merely short of disk space and want to preserve the GEMPACK software for later use,

1. you can just delete some of the GEMPACK Executable images from the GEMPACK subdirectory, for example, GEMPIE.EXE, SLTOHT.EXE etc
2. **Don't delete** ZIP.EXE, UNZIP32.EXE, GRABSCRN.EXE or BUILDGP.EXE
3. You can also delete the libraries (*.LIB) in the GEMPACK directory and the libraries in subdirectories LIBS and TABLO.
4. If you later want to restore GEMPACK, restart BuildGP as described in section 3.7.1 and rebuild the libraries and executable images.

3.15 Text Editor

When installing and using GEMPACK, you will need to be able to edit text files. This is often done best using a text editor (that is, an editor designed for handling text files exclusively). A text editor EDIT is supplied with DOS or Windows. There are many other text editors available on PC machines.

We recommend that you use the text editor **TABmate**. TABmate has syntax highlighting which is excellent if you are writing or debugging TABLO Input files. TABmate can also be used for other text files, can open several files at the same time and has various Tools which are useful for GEMPACK development.

You can use the older text editor GemEdit.

Alternatively, you can use a word processor (such as Microsoft Word or WordPerfect) to edit text files; if so, you must be careful to save the resulting file as a text file.

3.16 Using GEMPACK in a Teaching Situation

You may be interested in using GEMPACK for teaching GE modelling in a computer laboratory.

If so, the Source-Code Version is not ideal since it requires a Fortran compiler and the cost of licensing any of the Fortran compilers in a laboratory situation is high.

We use the Limited Executable-Image Version of GEMPACK in our courses (for example, the Practical GE Modelling course – see http://www.monash.edu.au/policy/pgemc.htm). This does not require a Fortran compiler. We have found it ideal for teaching.

If you have a multi-user Source-Code GEMPACK licence for your university (etc), we will be happy to supply you with a Limited Executable-Image CD which you can use in your teaching.

CHAPTER 4

4 Testing the Installation

In this chapter we suggest that you test the main features of the installation by carrying out a simulation with the Stylized Johansen model.

If this simulation does not work, you will need to go back to some of the steps in section 3.9 above.

4.1 Making a Directory for the Stylized Johansen Model

Start WinGEM running, following the procedure described in section 2.4.1 of GPD-1. Then prepare a directory for the model SJ (Stylized Johansen) and set the working directory, as described in sections 2.4.2 and 2.4.3 of GPD-1.

If you are an experienced user, you might like to follow the brief notes in section 2.4 of GPD-8 instead.

4.2 Checking the DOS Path and Access to Your GEMPACK Licence

Before carrying out the test simulations, we suggest that you check that your PATH has been set correctly and that GEMPACK programs are able to access your GEMPACK licence.

To do this, select from the main WinGEM menu

File | Shell to DOS

[That is, click on ***File*** and then click on ***Shell to DOS*** from the menu items which drop down.]

This will start a DOS box running. In that DOS box, type in the commands

cd \temp (or some directory where you are able to write files)
tablo

If your PATH is set correctly, the GEMPACK program TABLO will start to run and it will find your GEMPACK licence. In this case you will be offered lots of options for the program TABLO.

Stop TABLO running by typing **Control-C** (that is, hold down the Control key, which is usually on the left of your keyboard and may be labelled "Ctrl", and, while holding it down, touch the C key). TABLO should stop running (though you may need to type Control-C twice). Now type

exit

which should close the DOS box. You are now ready to carry out the test simulations, so please skip to the next section.

1. If TABLO does not start running, your PATH is not as required. This may mean that you didn't accept the BuildGP's suggestion about changes to your AUTOEXEC.BAT file, or perhaps you haven't yet rebooted your computer since you made these changes. Please check again the steps in section 3.9 and then repeat this part of the testing.
2. If TABLO started running but reported that it could not access your GEMPACK licence, the error message will tell you which licence file the program was trying to access. Please check that your licence file (it must be called LICEN.GEM) is in the directory in which you installed GEMPACK. If the program indicates it is trying to access LICEN.GEM in a directory which is different from the one in which you installed GEMPACK, check the parts of section 3.9 which relate to the Environment variable GPDIR. Repeat this testing once you have remedied any problems.

You can check that the PATH and GPDIR are correctly set as follows. First go into a DOS box, and then type the DOS command

set

Check that the PATH is as you expect, that is, that it includes the GEMPACK directory (usually C:\GP). If you installed GEMPACK in a directory other than C:\GP, also check that the variable GPDIR has its expected value. If either of these is not as required, read section 3.9 (and check that you rebooted). You can close the DOS box by typing

exit

Repeat this testing once you have remedied any problems. Only proceed when everything is as required.

If you are unable to diagnose the problems here, please click on WinGEM (which should be at the top of your screen). Select

Options | Show Diagnostic Information

Save this information in a file. Then please send (via email or fax) this file (it is a text file) to us at the Impact Project. We will endeavour to assist. Details about how to contact the Impact Project are in section 1.2.

4.3 Simulations to Test GEMPACK and WinGEM

To test that GEMPACK and WinGEM are working correctly, we suggest that you carry out the simulations with Stylized Johansen in section 2.4 of GPD-1. These examples carry out the simulation using a TABLO-generated program in section 2.4.6 of GPD-1. You might also like to carry out this same simulation using GEMSIM, as described in section 2.4.7 of GPD-1. In either case, check that the results of the simulation are as expected (see, for example, section 2.7 of GPD-1).

If you are a new user of GEMPACK, we recommend you work through the Stylized Johansen example in Chapter 2 of GPD-1 rather than using the brief notes on Stylized Johansen in section 2.4 of GPD-8.

If any of these tests does not work, re-check the steps in the installation in section 3.9 above.

4.4 Keep and Temporary Directories and GEMPACK Windows Programs

Some changes have been made to cope with changes in Windows 2000 and XP. The older versions of the GEMPACK Windows programs used to write INI files and temporary files in subdirectories of the Windows directory. This causes problems under Windows 2000 and XP where a "standard" user may not be allowed to write or delete files in the Windows directory or any subdirectory of it.

- The position of the Keep Directory where the INI files are stored has been changed to a subdirectory of the user's "My Documents" directory.
- The default place where GEMPACK Windows Programs write temporary files has been moved from under the Windows directory to a subdirectory of the (user's) TMP or TEMP Environment variable.[17] You can reset the TMP variable as described in section 3.1.1.
- In RunGEM, WinGEM, AnalyseGE and RunMONASH there are Menu Options within the programs which allow you to set your Temporary directory to a directory of your choosing. The program remembers this Temporary directory setting. When you start the programs for the first

[17] For example if your Environment variable TMP is set to C:\TEMP, the default temporary directory for WINGEM would be C:\TEMP\GPTEMP\WINGEM.

time, the default temporary directory is set from the value of the TMP or TEMP environment variable.

- For very unusual cases, there are new ways to avoid problems with the Keep and the default Temporary directories by setting environment variables called **GPKEEP** and **GPTEMP**.
  Set a new environment variable called GPKEEP if you want to change the usual Keep Directory.
  Set a new environment variable called GPTEMP if you want to change the default temporary directory without changing the environment variable TMP.

If you are having problems with these features of one of the GEMPACK Windows programs, consult the relevant Help file for details and advice.

CHAPTER 5

5 Hands-On Computing on the PC

In this chapter we give suggestions for hands-on computing which will help you to become familiar with many important features of the use of GEMPACK on the PC. These are based on the models supplied with GEMPACK (see chapter 1 of GPD-8), especially the Stylized Johansen and Miniature ORANI models.

We recommend that you follow the Windows way of working as described in section 5.1 below unless you prefer to work at the DOS prompt, in which case you should follow section 5.2 below.

Note that the files corresponding to the example models sent with GEMPACK are all in the EXAMPLES subdirectory of your GEMPACK directory (usually C:\GP\EXAMPLES). You should be able to carry out simulations with all of these models in 32Mb of memory or (48Mb for Windows NT, 2000 or XP).

5.1 Using WinGEM

Detailed suggestions for hands-on computing using WinGEM can be found in chapter 2 "Getting Started with GEMPACK via WinGEM" of GPD-8. This begins with examples based on the Stylized Johansen and goes on to examples based on Miniature ORANI, GTAP, ORANIG and ORANIF.

5.2 Not Using WinGEM

Detailed suggestions for hands-on computing without using WinGEM can be found in chapter 3 "Unix/Command Prompt: Hands-on Computing" of GPD-8. This begins with examples based on the Stylized Johansen and goes on to examples based on Miniature ORANI.

CHAPTER 6

6 Working with GEMPACK on a PC

The following sections contain other information relevant to working with GEMPACK on your PC.

6.1 New Model's Directory Location

We suggest that you put each new model you build in a separate directory on the hard disk, outside of the GEMPACK directory (usually C:\GP). Note that your PATH setting will ensure that the GEMPACK programs are found correctly. Conversely if your PATH and GPDIR are not set correctly, the GEMPACK programs will not run.

When you use WinGEM with any model, make sure that you set WinGEM's working directory to point to the directory containing the files for this model (as spelled out in section 2.4.3 of GPD-1).

6.2 For Speed, Use TABLO-generated Programs

You have installed a source-code version of GEMPACK on your PC and have a suitable Fortran compiler, so you will probably prefer to use TABLO-generated programs instead of GEMSIM for simulations. For small models such as Stylized Johansen and Miniature ORANI there is not much difference in speed. But TABLO-generated programs will run faster with large models. [Some CPU times are reported in chapter 4 of GPD-8.]

6.3 Working in a DOS Box

Most GEMPACK users prefer to work in a Windows way via WinGEM (or perhaps via RunGEM and TABmate – see section 5.4 of GPD-8). If so, **you can skip this section** and go to section 6.4.

Some GEMPACK users prefer to work at the DOS prompt. If so, you will find useful information in this section.

6.3.1 Compiling and Linking TABLO-generated Programs

Wherever your TABLO-generated program is located on the disk, you can compile and link it using the command LTG. For example, to compile and link the program SJ.FOR, the command is

LTG SJ

[Don't add the suffix .FOR.]

Occasionally, you may need to increase the stack size – see section 6.6.1 below.

6.3.2 TABLO-generated Programs

When you run TABLO to produce a TABLO-generated program, you will notice that TABLO produces several extra files with suffix .FOR as well as the usual files with suffixes .FOR, .AXS and .AXT.

For example, when you run TABLO on SJ.TAB, TABLO produces

- SJ.FOR [the TABLO-generated program]
- SJ.AXS and SJ.AXT [the Auxiliary files – see section 3.2 of GPD-3]

- SJ.MIN (the Model Information file – see section 3.4.1 of GPD-3), and
- various Fortran **module files**, namely
  SJ_C0.FOR, SJ_C1.FOR and SJ_C3.FOR to SJ_C7.FOR [not SJ_C2.FOR]
  SJ_U0.FOR to SJ_U4.FOR,
  SJ_V0.FOR, SJ_V1.FOR and SJ_V3.FOR to SJ_V6.FOR [not SJ_V2.FOR],
  and SJ_M0.FOR.
  These module files are required for compiling and linking the TABLO-generated program (similarly to the .FOR file).[18]

Note that the number of module files is different from Release 8.0 (see section 6.3.2 of the Release 8 version of GPD-6).

No Ux.FOR or Vx.FOR module files are produced if the TAB file for the model has no update statements or levels variables. For example, there are no SJCHK_U*.FOR or SJCHK_V*.FOR module files associated with the TABLO-generated program for the data-manipulation TAB file SJCHK.TAB.

For very large models, there may be more module files than those listed above. For example,

> suppose that a model MODEL1.TAB has 2500 Coefficients (after Condensation, which may increase the numbers of Coefficients considerably – see section 2.3.2 of GPD-2). Then TABLO will produce the extra MODEL1_Cxy.FOR module files for x=1..6 and y=1..3. [For example, there will be files MODEL1_C41.FOR to MODEL1_C43.FOR.] Information required for the first 1000 Coefficients is placed in the Cx1.FOR files, information about the next 1000 Coefficients goes in the Cx2.FOR files and information about the last 500 Coefficients goes in the Cx3.FOR files. Similarly there will be extra MODEL1_Uxy.FOR files. And there will be extra MODEL1_Vxy.FOR files if the model has more than 1000 Variables.

These extra files are produced in order to make it easier for the compiler. [Some compilers (including LF95 and LF) do not handle very large files well.]

The module files above are not required for running the TABLO-generated program so if you delete the main .FOR file (for example, SJ.FOR) you can also delete these files (for example, SJ_C1.FOR).

6.3.3 Running GEMPACK Programs in a DOS Box

Under DOS, this is done just by typing in the name of the program, as in, for example,

> **sagem**

Because the GEMPACK directory is on your DOS PATH, your computer should find SAGEM.EXE in your GEMPACK directory and start it running.

For TABLO-generated programs, change to the directory where the TABLO-generated program is. Type in the name of the program, for example,

> **sj**

to run the program SJ.EXE.

New command line options for some programs are introduced in Release 9.0 – see section 10.1 of GPD-5 for details. If you like working at the DOS prompt, or if you use DOS batch files (see section 6.7), you will probably make considerable use of these command line options.

---

[18] These module files were introduced in Release 8.0. In Release 7.0 and earlier, Fortran 90 TABLO-generated programs required a file with suffix .F9M (for example, SJ.F9M) instead of these. The .F9M file is produced on Unix machines by Release 8.0 of GEMPACK.

Example

The command

tablo sj –pgs –log sj.log

provides complete user input for running TABLO to produce output for GEMSIM (-pgs) and the log file SJ.LOG.

We strongly suggest that you always work in the DOS box that WinGEM provides via the Menu option:

File | Shell to DOS

The settings of this DOS box have been designed to produce good productivity, especially for GEMPACK users who are running long simulations in a DOS box and simultaneously working with other Windows programs (for example, word processing or spreadsheet programs). In particular, programs running "in the background" in these DOS boxes usually receive a reasonable fraction of total CPU time without disrupting the foreground task.

6.3.4 Interrupting Programs

Sometimes you will start a program running and then realise that it is not doing what you intend. You can interrupt the program and return to the DOS prompt by typing **Control-C** (that is, hold down the Control key, which is usually on the left of your keyboard and may be labelled "Ctrl", and, while holding it down, type C). Sometimes you may have to type Control-C twice to achieve this.

6.3.5 Controlling Screen Output

Often screen output goes much too quickly for you to read. You can control it using the

Control-S Control-Q

keystrokes. (For Control-S, hold down the Control key, which is usually on the left of your keyboard and may be labelled "Ctrl", and, while holding it down, type S).

Use Control-S to stop the screen output and Control-Q to start it again. You can repeat these as needed. However, if you get out of step, say by typing two Control-S in a row, you will lose control of the output and have to wait until the program ends; even Control-C (see section 6.3.4 above) will probably fail then.

On some machines the Scroll Lock key works in a similar way. (It first stops screen output, then starts it, then stops it, and so on.)

6.3.6 Using Stored-input Files in a DOS Box

You can use Stored-input files under DOS either via the GEMPACK **sti** option, or using the command line **-sti** feature (see section 5.5 of GPD-1), as in, for example,

modhar -sti modsj.sti

You can create Stored-input files using option **sif** – see section 4.3 of GPD-1 for introductory examples.

If you make your own Stored-input files using a text editor, it is a good idea to include the line

bat

at the start of these files. This means that, if the program encounters invalid input, it will stop. (See section 5.3 of GPD-1.)

We do not recommend using input redirection as in "modhar < modsj.sti". We have found that the **-sti** feature is more robust, especially under Windows NT, 2000 and XP.

6.3.7 Use a Log File to See Screen Output

If the screen output is too fast for you to read, you can always save a GEMPACK log file. This is just a text file that contains all the output to the screen. See section 5.5 of GPD-1. For example,

modhar -sti modsj.sti -log modsj.log

saves a log file called MODSJ.LOG which you can look at in your text editor.[19]

6.3.8 Making Executable Images of GEMPACK Programs in a DOS Box

In general, executable images of the GEMPACK programs are made as part of the installation of GEMPACK Source code as in section 3.8. However you may wish to remake just one of these programs in a DOS box.

In a DOS box change to the directory where you installed the GEMPACK programs (usually C:\GP).

c:
cd \gp

Then to make a main program for example ACCUM, enter the command

mkmain accum

This command *mkmain* works with all the main programs except GEMSIM and TABLO, where the appropriate commands are

mkgemsim

mktablo

[To make executable images of TABLO-generated programs, see section 6.3.1.]

6.3.9 Variants of LTG

In your GEMPACK directory, there are various BAT files related to the main LTG.BAT file and used in various situations to compile and link Fortran programs to the GEMPACK libraries.

Debug LTG: LTGDEB.BAT (LF95 and LF only)

When compiling and linking a TABLO-generated program with Fortran compilers LF95 or LF, you may occasionally get the error message

"8694-U The number of procedure or data reference exceed compiler limit" .

This problem can be sometimes be solved by using LTGDEB.BAT to cut the main .FOR file into smaller pieces[20]. To use LTGDEB.BAT, in your GEMPACK directory, type the commands

```
copy  LTG.BAT  LTGWAS.BAT
copy  LTGDEB.BAT  LTG.BAT
```

Then try LTG (Compile and link) again with your TABLO-generated program.

---

[19] We have found using "-log" more robust than output redirection via ">", especially under Windows NT, 2000 and XP.

[20] The LF95 "-split" option does not work.

Keep/Delete Fortran LTG: LTGKPFOR.BAT and LTGNOFOR.BAT

After compiling and linking a TABLO-generated program, the BAT file LTGNOFOR.BAT deletes the relevant Fortran .FOR files (the one for the TABLO-generated program and the .FOR files containing its modules).

The BAT file LTGKPFOR.BAT does not delete these .FOR files.

LTG.BAT is usually the same as LTGNOFOR.BAT which tries to clean up .FOR and .OBJ and .MOD files once the EXE file for the TABLO-generated program has been created. LTGKPFOR.BAT is mainly used for debugging TABLO-generated programs.

No Modules LTG: LTGNOMOD.BAT and LTGFNMOD.BAT

A few GEMPACK Source-code users may be interested in writing their own Fortran programs using GEMPACK subroutines. If you are so interested, please see Harrison *et al* (2005).

If you are writing your Fortran program in fixed format, you can compile and link to the GEMPACK libraries using LTGNOMOD.BAT instead of LTG.BAT. The "NOMOD" refers to the fact that there are no Fortran module files for your program unlike TABLO-generated programs which have several module files – see section 6.3.2.

If you are writing your Fortran program in free format, you can compile and link to the GEMPACK libraries using LTGFNMOD.BAT.

6.4 Memory Management

The features of Fortran 90 allow greatly improved memory management as described in chapter 13 of GPD-3. If you are using the Lahey LF90 compiler or the Fujitsu-Lahey compiler LF95, you should no longer receive messages to increase program parameters.

6.4.1 If a Fortran 90 Program Runs Out of Memory

The task you are carrying out with any of the programs may require more memory than is available on your computer. If so you will receive a message saying that the program is stopping because it is

unable to allocate sufficient memory.

If this happens, you may be able to free up more memory by closing down any other applications running (for example, word processors), in which case you can then try to rerun the task. Otherwise you need to find some other way of carrying out the task (or buy more memory).

[If you are running GEMSIM or a TABLO-generated program, sometimes this error occurs if you have forgotten to condense your model.]

6.5 Compiler Options

The compiler options used in the standard installation (as carried out in section 3.8 above) are ones which, in our experience, compile relatively quickly and which produce executable images which run as fast as possible. We recommend that you do not change these compiler options without consulting us.

6.5.1 Optimization Levels

There are several different options available with the Lahey LF90 and Fujitsu/Lahey LF95 and LF compilers. For the GEMPACK user, the only ones you may wish to change are the options relating to level of optimization:

-o0 to perform no optimization. The compiler option –o0 results in quicker compilation and linking.

-o1 to perform certain standard optimizations of object code.[21] In some cases, optimization results in faster run-times. However, for TABLO-generated programs (which often have several thousand lines of code), this option can cause unacceptably long compile/link times.

In previous Releases of GEMPACK, we have recommended –o0 (no optimization).

For Release 9, we recommend using optimization –o1 for some parts of the standard build. For example, we have found that compiling the Harwell routines with –o1 can reduce run times considerably.

6.5.2 Compiler Options for Lahey/Fujitsu LF95 or LF Version 7 Compiler

For Release 9 we have included option –o1 in standard configuration file (LF95.FIG) in the SUBS, MODULES and TABLO subdirectories but –o0 in the GEMPACK directory. This default setting is produced by running the BAT file O1FIG.BAT.[22]

If you change the optimization level (by changing the LF95.FIG file in one or more subdirectories), you need to build GEMPACK libraries and programs again to see the effects. You also need to recompile and link your TABLO-generated programs.

TABLO-generated programs. The configuration file LF95LTG.FIG (in your GEMPACK directory) is used when compiling and linking TABLO-generated programs. This controls the level of optimization. The default is –o0 (no optimization).

- To change to the –o1 option, use the BAT file LTGFIGO1.BAT in the main GEMPACK directory.
- To change back to the –o0 option, run the BAT file LTGFIGO0.BAT.
- If your model is slow at run time, you can experiment with –o1. After you have run the LTGFIGO1.BAT file, you will need to recompile and link your model (for example, using WinGEM or using LTG at the DOS prompt). However, you may find compile times are unacceptably long. If so, you can use LTGFIGO0.BAT to put back option –o0.

6.5.3 Compiler Options for Lahey Compiler LF90

For Release 9 we have included option –o1 in standard configuration file (LF90.FIG) in the SUBS and MODULES subdirectories but –o0 is used in the TABLO subdirectory for LF90 because the compile and link of GEMSIM.EXE and TABLO.EXE is too slow with –o1. This default setting is produced by running the BAT file O1FIG.BAT.[23]

---

[21] See your compiler manuals for details.

[22] The file LF95.FIG controls the level of optimization (and other compiler options) for LF95 and LF. We provide two main variants, namely LF95O1.FIG (which includes –o1) and LF95FST.FIG (which includes –o0). The BAT file FSTFIG.BAT sets –o0 in the GEMPACK directory and all subdirectories.

[23] The file LF90.FIG controls the level of optimization (and other compiler options) for LF90. We provide two main variants, namely LF90O1.FIG (which includes –o1) and LF90FST.FIG (which includes –o0). The BAT file FSTFIG.BAT sets –o0 in the GEMPACK directory and all subdirectories.
We have found one example in which –o1 with LF90 produced bad code. We have worked around this by changing our code slightly, so this example is no longer a problem. Asking compilers to do optimization always introduces a slight risk that bad code will be produced (which is mainly why we did not recommend –o1 by default prior to Release 9). We now think that the speed up gained from using –o1 outweighs this risk. However, if you think that the compiler may be producing bad code, please contact us.

If you change the optimization level (by changing the LF90.FIG file in one or more subdirectories), you need to build GEMPACK libraries and programs again to see the effects. You also need to recompile and link your TABLO-generated programs.

TABLO-generated programs. With LF90, the configuration file LF90.FIG in the main GEMPACK directory is used when compiling and linking TABLO-generated programs. This controls the level of optimization. The default is –o0 (no optimization) because –o1 causes unacceptably long compile times.[24]

6.5.4 Changing the Optimization Setting (All Compilers)

Two BAT files in the GEMPACK directory (usually c:\gp) are used to swap between the two optimization settings. The file FSTFIG.BAT sets the optimization option at –o0 in all subdirectories and the file O1FIG.BAT sets the optimization at –o1 in certain subdirectories.[25]

To use these BAT files, go to the DOS prompt and change directory to your GEMPACK directory. Then type in the name of the BAT file. After you have run either of the BAT files FSTFIG.BAT or O1FIG.BAT, you need to build the GEMPACK libraries and programs again. You also need to recompile and link your TABLO-generated program using LTG.

6.6 Advanced Compiler Use

This section contains a collection of sections relating to errors and options for the Lahey compilers on a PC.

6.6.1 Changing The Size of Program Stacks for TABLO-generated Programs

You may get an error message saying that a TABLO-generated program has run out of program stack. In this case you must increase the size of the program stack. The file LTG.BAT which is used to compile and link TABLO-generated programs (see section 6.3.1) includes a default stack size following "-stack". (To see the current default value, look in this file in directory C:\GP.) You can increase the stack size for TABLO-generated programs by passing you desired stack size to LTG as a second argument.[26] For example

ltg model 800000

produces an executable image of the TABLO-generated program MODEL.FOR and sets the stack size to 800,000 bytes. If, when you use LTG to increase the stack size, your current size isn't large enough, try increasing it again.

You can get a good indication as to how large to make the stack size by looking at the compilation phase. When the main program is compiled (this happens at the start of the LTG command), you will probably see a warning message about the minimum size of the stack in cases where the stack size given by LTG is not large enough.

---

[24] For this reason, we do not recommend that you put option –o1 in the LF90.FIG file in your GEMPACK directory. [If you do, you will be using –o1 when compiling TABLO-generated programs.]

[25] The subdirectories in which –o1 applies is different for LF95/Lf and LF90. See sections 6.5.2 and 6.5.3 above for details.

[26] The LTG2 command used with Release 5.1 to increase stack size is now simply LTG.

6.6.2 Maximum Amount of Memory Available to Programs

At present, there is a limit under Windows that programs are not allowed to access more than 2 Gigabytes of memory. Even if you have more memory than this on your computer, Windows restricts you to this limit.

6.6.3 Stand-alone Executable Images

In Release 7.0 and later Releases, LF90 and LF95 make Winconsole executable images which are stand-alone. Hence for LF90 or LF95, you do not need to do anything special to make stand-alone EXEs.

6.7 DOS Batch Files

If you create DOS batch (.BAT) files for carrying out tasks including running GEMPACK programs, you may like to take advantage of the fact that, if any GEMPACK program ends with a fatal error, it sets the value of the DOS parameter ERRORLEVEL value to 1. You can test for this in .BAT files to stop the batch job early in such a case.

For example, the .BAT file below runs SAGEM and then GEMPIE. If the SAGEM run ends unsuccessfully, the test of ERRORLEVEL after it aborts the batch job and gives a message saying that the job was unsuccessful.

```
REM Beginning of batch file
REM  Run SAGEM
REM Next uses the –sti option (see section 5.5 of GPD-1)
sagem  -sti sag1.sti  -log sag1.log
REM test ERRORLEVEL to see if this was successful
if errorlevel 1 goto error
REM  Run GEMPIE
gempie -sti gemp1.sti  -log gemp1.sti
if errorlevel 1 goto error
echo off
echo BATCH JOB SUCCESSFUL
goto endbat
:error
echo off
echo *** ERROR: BATCH JOB FAILED ***
:endbat
REM End of batch file
```

All GEMPACK programs have options **dro** and **dre** which can be used in BAT files to check whether or not a program has run successfully. See section 5.4.1 of GPD-1 for documentation about these options and for an example BAT file showing how they can be used. These provide an alternative to the use of ERRORLEVEL tests, the effects of which can be difficult to predict and can vary slightly between the different versions of Windows.

Provided your GEMPACK programs are made with Release 6.0 or later of GEMPACK, we strongly recommend that you use "-sti" (as above – see also section 6.3.6) to run GEMPACK programs in a DOS batch file (rather than using input redirection). We have found "-sti" more robust under Windows NT, 2000 and XP than input redirection. The same applies to "-log" (rather than output redirection) if you want to generate a LOG file – see also section 6.3.7.

New command line options for some programs are introduced in Release 9.0 – see section 10.1 of GPD-5 for details. You may be able to use these command line options to reduce the number of Stored-input files you need in your batch files.

6.7.1 Trapping for LTG Errors in DOS Batch Files

If LTG.BAT (which is used to compile and link a TABLO-generated program) encounters an error, it now sets ERRORLEVEL to 1. [This did not happen with Release 8.]

If you are calling LTG in your own DOS batch file, and if you run it via "call ltg ..", you can now catch errors by testing ERRORLEVEL. See section 6.7 above for more details.

Example.

```
call ltg sj
if errorlevel 1 goto error
sj –cmf sjlb.cmf
if errorlevel 1 goto error
goto endbat
:error
echo ** ERROR: BAT JOB FAILED
:endbat
```

CHAPTER 7

7 Installing GEMPACK on a Network

Some organisations have found it desirable to run the Windows PC Source-code Version of GEMPACK and the associated Fortran compiler from a network. For example, this can reduce the need for separate copies of the Lahey compiler.

Below are some pointers to using GEMPACK and/or Fortran on a network.

If you have the Lahey Fortran LF90 or LF95 on a network, please note the following.

(i) When compiling (eg via LTG), the Fortran compiler needs to know where the relevant Fortran library is to be found. You can avoid having to edit the various .BAT files by having all users set the value of the DOS Environment variable **GPFLIB** to point to this directory. You can set this environment variable using the method described in section 3.1.1.

The person installing GEMPACK (building the libraries and executable images) should set Environment variable GPFLIB (and reboot, if necessary) before running BuildGP (see section 3.6 above).

(ii) Another issue is who has access to the GEMPACK source etc on the network. Everyone needs read and execute permissions but only the administrator may need write access.

(iii) You need to install the Release 9.0 versions of the Windows programs, especially if you are using Windows 2000 or XP on the network, since these new versions of the Windows programs do not write to any subdirectories of the Windows directory.

(iv) Some networks have programs such as the NAL installer for installing files on a network in a computer laboratory. You install GEMPACK on one master machine. These programs take a snapshot of the computer files and directories before installation, then you install GEMPACK on the master machine, and then a snapshot is taken after installation. On installing the package in the laboratory, just the differences between the two snapshots are installed on the laboratory computers.

7.1 Installing GEMPACK under DOS or in a DOS Box

If you need to install GEMPACK under DOS or in a DOS-like box instead of using the Windows installer, please contact the Impact Project for instructions.

CHAPTER 8

8 If You Are Unable to Install from a CD

If you do not have a CD drive on your PC, you may be able to copy the contents of the CD temporarily to your server and access the files on your PC from the server, as explained in section 8.1 below.

8.1 Installing from the Source-Code CD Copied to the Network

If you copy all the files from the GEMPACK Source-code CD onto the network file server, you can use the files so copied to install on other machines (including those without a CD drive) attached to the network.

To do this, use *My Computer* or *Explorer* to copy **all** files in the top directory **e:** and the directories **e:\GPSC** and **e:\ACROBAT** from the GEMPACK Source-code CD to a directory on the network (and appropriate subdirectories).[27] There is no need to copy the files for the CoPS Web pages in directory **e:\HTM**. Then you can run the copied INSTALL.EXE to install GEMPACK on the network or on other machines which have access to the network.[28]

[27] Here we are assuming that your CD is drive e: . [Change as appropriate.]

[28] Suppose, for example, that you have copied all files (including those in all subdirectories) from the CD into directory V:\DATA\PROD. Then you can Run program V:\DATA\PROD\INSTALL.EXE to install GEMPACK.

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