A note about this manual:

This version of the LTPlus User's Manual was derived from the 19 ***.dcx** files available in January 1994 from the ftp server on **moon.cecer.army.mil**. These text files were reformatted to be mostly consistent with the LTPlus Manual provided to Central Washington University when the project (by David Satnik) to port LTPlus to the UNIX/GRASS/X-windows environment was originally begun. The reformatting was done by me using Ami Pro v. 3.0 under MS-Windows. Note that the files downloaded from the "moon" ftp server did not correspond exactly to the original manual that we had. **The "moon" version is obviously later than the original version; it contains editorial corrections, expanded explanations, a few additional command parameters, and some additional commands (which may not be in the GRASS version of LTPlus);** it also possibly omits a few commands contained in the original manual (especially some discussed in Chapter 4). Also, note that many of the items about system requirements, installation and operation in Chapter 1 are not applicable to many Unix platforms, only to the original LTPlus platform (a 386/486 PC with Xenix or SCO Unix).

I have made additional editorial changes and corrections during the reformatting process, but have not changed the technical content. Appendices and the index in the original versions have been omitted from this version.

The final step in producing this document was to print each of the 19 chapters from Ami Pro to an Encapsulated Postscript file for each chapter. A different font, Times New Roman, was used for this version so it could be easily distinguished from versions of the manual obtained from other sources.

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Chapter 1 -- SYSTEM INFORMATION

LTPlus was designed to replace the *Line Trace System* at the USDA-FS *Geometronics* Service Center in Salt Lake City. The old Line Trace package allowed a skilled operator to edit and assign attributes (elevation values) to contour lines which were initially captured by scanning reduced U.S. Geological Survey quadrangle map separations. The operator snapped (connected) lines through the gaps which existed for the printed elevation values and recorded the elevations as attributes to the contour line objects. The resulting product was a *Digital Elevation Model* (DEM) file.

SYSTEM CAPABILITIES

The most efficient way to replace the Line Trace System was to convert a very successful and accepted program called LIDES (*Local Interactive Digitizing and Editing System*) from Hewlett Packard Extended BASIC language to the more universal "C" language, and from the HP9020 BASIC operating system to a PC-based UNIX environment. All of the powerful capabilities of LIDES were ported to the new operating system in the "C" language, and the package was enhanced to include all of the operations specific to Line Trace. The resulting software package, named LTPlus (for Line Trace Plus), offers these capabilities:

> Data input from manual digitizing, electronic scanning or from a variety of external application data formats.
> Full graphic *raster* and *vector* editing with mouse power.
> Automatic *topology* construction.
> Flexible attribute assignment operations.
> Dynamic set operations.
> Selective plotting and reporting functions.
> Wide range of export formats for external application compatibility.
> Variety of user-friendly file management functions.
> Powerful *macro* command language.
> Valuable online help facility.
> Complete *geodetic referencing*.

These characteristics describe a software package which can offer enhanced, high-speed line tracing capability and provide the means for the collection, topological structuring, attributing and formatting of all levels of resource data for input to a *Geographic Information System (GIS)*. LTPlus can boast about one other, extremely significant attribute--it has a very strong human interface; this program will embrace the needs of the computer novice while still challenging the most calloused technocrat.

SYSTEM MANAGEMENT

This section of the LTPlus User's Guide contains information valuable to the system manager, including documentation of system requirements, software installation, system configuration techniques, the database file structure, and program fixes and updates.

SYSTEM REQUIREMENTS

LTPlus is not a public domain product (whether or not LTPlus will be copyrighted by the US Government has yet to be determined). The Federal Government makes no warranties, either expressed or implied with respect to this software, its quality, performance, merchantability or fitness for any particular purpose. The Federal Government reserves the right to make improvements in this software at any time and without notice. It is designed to operate on a system with the following minimum requirements (other devices may be supported - See **Appendix D**):

> 80386 (or better) CPU, w/8Mb RAM
> 100+ Mb hard disk
> BIOS and register-compatible VGA graphics card
> 400 x 600 resolution, multisync color monitor
> Digitizer
> HPGL plotter
> Floppy disk drive (3.5, 1.44Mb or 5.25, 1.2Mb)

> One parallel/two serial ports
> 80387 Math CoProcessor
> UNIX (Xenix SysV 2.3+ or AT&T System V 3.2+)
> Logitech-compatible, 3-button serial mouse

Optional hardware includes:

> System printer
> Tape cartridge drive
> Secondary digitizer
> Additional hard disk space
> Additional serial port

SOFTWARE INSTALLATION

The most current release of LTPlus will be provided to you upon request. The software can be supplied on the following media/formats:

5.25", 1.2Mb diskettes
3.5", 1.44Mb diskettes

Detailed software installation instructions are provided in **Appendix F**.

SYSTEM CONFIGURATION

The **lptinstl** command will create a default system configuration file, **/u[sr]/ltp/config/config**, unless one already exists from a previous LTPlus release installation. This file contains information about the hardware and database parameters for your system. LTPlus provides a command for modifying the **config** file (see **config**), but it may be necessary to change some of the hardware type/path declarations prior to initiating the LTPlus program. Please review the **config** file standard declarations (*Chapter 3*) to insure that LTPlus can be started up initially. If changes must be made prior to running LTPlus, it will be necessary to use whatever standard editor is available with your operating system (**vi**, **vedit**, etc.) to do so.

There is one other file, included under the same path, to which access is restricted. This file, identified as **/u[sr]/ltp/config/tolerance**, contains a value which represents the amount of *registration* error which may be accepted by a non-*superuser*. Generally speaking, an individual may become a superuser only by virtue of having and using a password assigned by the system manager. A superuser is allowed to modify the **tolerance** file, while a non-superuser is not. If a map registration error exceeds the tolerance value, the user is not allowed to continue with the map processing and a message is mailed to the system manager. Unlike the **config** file, to which the users must have access, the **tolerance** file is only modifiable by a superuser. The **tolerance** file may be altered using whatever standard editor is available on the system. A **null** (0) **tolerance** value will permit the processing of all maps, regardless of the magnitude of the registration error.

DATABASE FILE STRUCTURE

The **config** file includes the database file path and address assignment. Unless there is a very valid reason to deviate from the default values, it is recommended that the **maps_path** element remain unchanged from the supplied standards, with the only variation being the device identifier which is specific to your system. In the default scenario, the program, user and map data files are loaded under **/u[sr]/ltp** concatenated with the appropriate subdirectory name. The file structure is shown below. For additional details, please review the LTPlus *Technical Reference*.

/u[sr]/ltp (directory)

/bin (directory)
/ltpdist (distribution package)
/ltpgo (LTPlus application)

/ltpinstl (installation package)
/ltplus (LTPlus application)
/config (directory)
/config (default device/address settings)
/tolerance (registration deviation value)
/header (default map header file)

/cursor_keys (directory)
/(**set name**) (cursor button mapping)

/dictionary (directory)
/(**dict name**) (user dictionary)

/digitizers (directory)
/(**digitizer name**) (digitizer driver)

/digmenus (directory)
/(**digmenu name**) (user digitizer menus)

/export (directory)
/(**file name**) (ascii file exported)

/help (directory)
/(**helpfile name**) (help description)

/import (directory)
/(**file name**) (ascii file for import)

/macros (directory)
/(**macro name**) (macro command(s) text)

/map_lists (directory)
/(**maplist name**) (map list file)

/maps (directory)
/(**map name**) (directory)
/(**file name**) (18 files/map)

/menus (directory)
/(**menuset name**) (user screen menuset)

/pens (directory)
/(**penfile name**) (user-defined penset)

/user_guide (directory)
/chapnn (directories 00-99)
/(**document name**) (ascii Word files)

UPDATES AND FIXES

Each new release of LTPlus will be distributed as a complete package. However, interim updates and/or fixes may be advisory in nature. Users may be notified about a specific correction to the system. All program modifications will be incorporated into subsequent releases.