TECHNOLOGIES

L/F - LINK 1.10 A

INSTALLATION GUIDE

L/F-Link

TurboDOS ENHANCEMENT PROGRAM

An MS-DOS 2.X implementation under TurboDOS 1.4 or 1.4+

INSTALLATION GUIDE

Rev. 1.10A last update August, 1985

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SECTION 1

OVERVIEW OF L/F-Link MANUAL

The sections in this manual are arranged in the order that they should be read. Section 2 provides an introduction to L/F-Link that will give an overview of the system and how it relates to TurboDOS and MS-DOS. Section 3 explains the various technical aspects of the system. Section 4 describes the actual installation procedure including all TurboDOS preparations and recommendations. Section 5 is a quick installation and boot guide.

In using this manual, we assume that you have a copy of TurboDOS 1.4 or 1.4+ and that it has already been installed on your system. Further, we assume that you know how to use TurboDOS and MS-DOS or have access to the respective operating system user and programmer guides. Therefore, we have not repeated any of the TurboDOS or MS-DOS instructions.

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SECTION 2

INTRODUCTION TO L/F-Link

2.1   What is TurboDOS?

TurboDOS is a disk operating system that enables the user to create and keep track of files, run and link programs and access peripheral devices that are attached to the computer. It is most distinguished by its ability to coordinate a "network" of interconnected "slave" cards each with its own processor, memory and serial I/O.

2.2   What is MS-DOS?

MS-DOS is a disk operating system that also enables the user to create and keep track of files, run and link programs and access peripheral devices that are attached to the computer. It is a **single-user** operating system.

2.3   What is L/F-Link?

L/F-Link is an interface program between MS-DOS and TurboDOS. It enables MS-DOS 2.X software to operate under the supervision of TurboDOS on the 80186 16 bit slave processor. It is **not** an emulator, but MS-DOS itself. L/F-Link, together with the MS-DOS kernel (MSDOS.SYS), is resident in the "transient program area" (TPA) as a normal TurboDOS application.

2.4   How does L/F-Link relate to TurboDOS and MS-DOS?

TurboDOS is the primary operating system. With L/F-Link, TurboDOS and MS-DOS applications can be run simultaneously, although each operating system has its own directory. Since TurboDOS and MS-DOS kernels are operating simultaneously, each logical disk running MS-DOS applications has dual directories: the normal TurboDOS directory and the MS-DOS directory (MSDIR, the root directory, and MSFAT, the file allocation table).

When L/F-Link is loaded, MSDOS.SYS is also loaded with the appropriate MS-DOS files. MS-DOS application programs can now be loaded and, upon completion of the L/F-Link installation, will run on the MS-DOS operating system just as any application would be run on a single-user MS-DOS system. Whenever the application requests a service from MS-DOS, the request is intercepted by L/F-Link and translated into a sequence of TurboDOS system calls that allows MS-DOS to execute the request.

Since L/F-Link allows MS-DOS to act as a multiuser system (more than one user running single-user software), there are certain commands and files that MS-DOS will use in the single-user environment that will be taken over by TurboDOS. This is why some of the files, normally on the MS-DOS system diskette, are not found in your directory. These commands

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are replaced by similar TurboDOS commands. Print spooling and disk format are examples of functions that TurboDOS performs.

2.5   What are the advantages of L/F-Link?

L/F-Link has been developed to allow businesses the capability of running applications under the TurboDOS and MS-DOS operating systems concurrently. L/F-Link was written to overcome the single-user limitations of MS-DOS by enabling it to take advantage of the multiuser environment of the TurboDOS utilities.

2.6   Who chooses L/F-Link?

There are two situations where the choice of L/F-Link is indicated. First, it will be welcomed by the business person who already has an investment in MS-DOS programs and files. The installation of an L/F Technologies system can provide multiple users with the ability to share a large library of business software as well as data files and expensive peripherals. At the same time, the investment in MS-DOS programs, files and data entry time is preserved.

In the second instance, L/F-Link will be useful to the business person who needs multi-user (more than one user accessing single-user software) capabilities but also needs to run a specific application that is available only for MS-DOS. The L/F Technologies system and TurboDOS supply the multi-user capabilities; L/F-Link provides the MS-DOS environment.

L/F-Link, used with TurboDOS, may be the answer to the expansion needs of a business currently using single-user MS-DOS applications, or it may be the answer to one installing a multi-user system where a specific application runs only under MS-DOS. Used with an L/F Technologies system, L/F-Link provides a bridge to the more powerful world of corporate computing offered by multi-user networking TurboDOS.

SECTION 3

TECHNICAL ASPECTS OF L/F-Link

This section will describe system requirements and limitations of L/F-Link. It is intended for the technical person who understands TurboDOS and MS-DOS. It is primarily a list of conditions that should be understood before finalizing disk partitions and other TurboGEN procedures.

3.1   System Requirements

L/F-Link will run under any TurboDOS implemention (version 1.4 or better) with 256K. Most MS-DOS 2.X software will run under L/F-Link. An L/F Technologies' 16 bit slave processor with either an 8 bit or 16 bit master is required. L/F-Link must be run on the slave processor not the master.

3.2   Limitations of L/F-Link

L/F-Link

L/F-Link will not run PC-DOS applications that require IBM machine-specific ROM-BIOS calls or bit-mapped graphics. The 1240 board ROM will trap an IBM ROM-BIOS call, display the message "unsupported interrupt number 'n' detected", and return the user to the current process. However, the user should discontinue the use of that particular application. (The 1081 board will not trap these ROM-BIOS calls; it will most likely reset the slave without saving any data.)

L/F-Link supports true multi-user file access under MS-DOS. Files are always opened in a shared mode. Record locking can be performed under L/F-Link by calling the corresponding TurboDOS system functions from the MS-DOS application. All MS-DOS applications have access to all TurboDOS system functions by issuing the corresponding interrupt. As in TurboDOS, record locking must be implemented in the software application.

The "files=" parameter in the CONFIG.SYS file, which determines the maximum number of files that can be opened simultaneously, cannot exceed 15 under L/F-Link. This is the default value set by L/F-Link.

The performance of normal MS-DOS applications should not noticeably change when operating under L/F-Link. However, MS-DOS programs that write to a disk file using many system calls to write only a few bytes each (as MS-DOS permits) should be avoided as much as possible. They usually cause substantial speed deterioration due to excessive system overhead. This is the case with redirection of console output to a file: the COMMAND.DIR file, for example, can be quite slow if the directory contains many entries.

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MS-DOS

Logical disk size is limited by MS-DOS convention; the largest disk size processable by L/F-Link and MS-DOS is slightly less than 16Mb with a 4K allocation block. The physical sector size is limited to 1K which is the default MS-DOS buffer size.

The number of buffers is not limited — 20 will greatly improve performance if there is enough memory. MS-DOS buffer size always defaults to 1K which is the largest physical sector size recognized by the system. If a floppy driver recognizes different formats, the corresponding drive must contain a diskette with the largest sector size at L/F-Link boot time, so the correct buffer size is selected. L/F-Link also automatically determines the physical memory size, so that MS-DOS always uses all available memory, regardless of TurboDOS configuration.

Interrupts 20H-27H are used by MS-DOS and cannot be used by TurboDOS for any other purpose.

All TurboDOS files having reserved MS-DOS filenames should be renamed prior to L/F-Link and SETMS execution. (A list of these names is included in the installation guide, section 4.3.)

As in TurboDOS, disks can be changed only if all users on that disk are idle, that is, all files have been closed and all buffers flushed. When running MS-DOS under L/F-Link, all users on that disk should terminate applications and return to the MS-DOS prompt if they are using the disk(s) being changed. Once the disk is idle, the system manager should run the MCHANGE.EXE utility supplied with L/F-Link. This works exactly like the TurboDOS CHANGE utility.

TurboDOS

Never use the same filename in different sub-directories unless they are in different user numbers. This is a TurboDOS restriction.

Drives should be assigned to users and users should be inhibited from use of other drives through SCHDRV or while TurboGENing the system.

In order for the user to be allowed to run L/F-Link, the user must be a privileged user in TurboDOS. This must be defined in USERID.SYS when configuring the system.

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Hardware Limitations

The READPC command on the 8 bit master processors, Z80A or Z80B, under TurboDOS 1.4 or 1.4+, with the 1081 S-100 (non-plus) bus 16 bit slave, will only read IBM 1.X floppy disk format (5 1/4" single-sided, 8 sectors/track). READPC cannot be run from the 8 bit master, it must be run from the 16 bit slave.

The READPC command on the 16 bit master processor, 80186, under TurboDOS 1.4 or 1.4+, with the 16 bit 1081 S-100 (non-plus) bus slave or the 1240 16 bit S-100+ (plus) bus slave, will read IBM 1.X and 2.X format (5 1/4" single or double-sided, 8 or 9 sectors/track). READPC cannot be run from the 16 bit slave when a 16 bit master is present, it must be run from the 16 bit master.

The 1081 board ROM will not trap the IBM ROM-BIOS calls. If an illegal call is made, the processor will reset. The 1240 board ROM will trap these calls and generate an error message.

L/F-Link cannot be run on the master.

Rare Limitations

A special case of MS-DOS system function 28H random block write is not supported by L/F-Link: if CX=0, no records are written, but the file size is adjusted. This adjustment can be performed by TurboDOS only if it does not alter the disk allocation. In any other case, L/F-Link will display "adjust" and MS-DOS will report an error.

Another unsupported, but rare, case is the creation of a user number sub-directory from another user number sub-directory, using the command: MKDIR ..\(user-no). It is, however, always possible to return to the root directory and create the new subdirectory from there.

3.4   Other technical conditions

When creating a new MS-DOS directory, SETMS automatically assigns TurboDOS files in non-zero user numbers to pre-defined MS-DOS sub-directories, named 1,2...31, according to the corresponding user numbers. They can also be created by MS-DOS (MKDIR), but only as direct children of the root directory. Any file or other sub-directory that belongs to the path of a user number (to any depth) is automatically created in the corresponding user number. All other files and sub-directories default to user 0.

3.5   Special Conditions

L/F-Link is not aware of disk allocation alterations made by TurboDOS users because they are not reflected in MSDIR and MSFAT. Should this happen by accident, all L/F-Link users should logoff as soon as possible. SETMS should then be run under TurboDOS to restore the directory compatibility. (All MS-DOS time stamps will be lost, as well as any sub-directories below the user level number.)

All MS-DOS floppies must be write-protected. MS-DOS floppy diskettes will be used only during the L/F-Link installation procedure. The TurboDOS command "READPC" is the only TurboDOS command that can be performed on an MS-DOS floppy. No other TurboDOS command, such as "DIR" or "COPY", can be performed on an MS-DOS floppy. These commands will corrupt the MS-DOS floppy.

SECTION 4

INSTALLATION PROCEDURE

This section will describe the TurboDOS preparations and recommendations that will allow more efficient use of TurboDOS and MS-DOS.

This section also provides a 5 step process for the installation of L/F-Link and the subsequent boot process that enables the user to access MS-DOS. The installation should not be done until a technical person has read section 3 and understands the limitations.

4.1   TurboDOS preparations

MS-DOS requires a special directory structure that must be created on all disks drives that MS-DOS will run on before running L/F-Link.

A special utility, SETMS.CMD, is provided for the purpose of creating these directories. This utility is run while the user is still in TurboDOS and works just like the TurboDOS CHANGE utility. SETMS automatically sets the date and time stamps for any NEW files it encounters. It always stamps the MS-DOS disk label to reflect the last time SETMS was run on that disk. If an MS-DOS directory (MSDIR. MSFAT and possible sub-directory files) already exists on any reference disk, it is checked for compatibility with the TurboDOS directory. If any difference is found, the MS-DOS directory is updated to reflect the exact status of the TurboDOS directory. SETMS, like TurboDOS FIXMAP and FORMAT utilities, attempts to lock the drive before processing it. SETMS, therefore, requires that no process access the drive while SETMS is operating.

MS-DOS requires the files MSDIR and MSFAT in order to run. Since MS-DOS is not aware of any disk allocation changes that take place in the TurboDOS directory, MSDIR and MSFAT should be assigned to a specific drive (not to exceed 16Mb) where only MS-DOS will be used. Should MSDIR be deleted, it is re-created by SETMS, but the MS-DOS sub-directory structure is lost during this process, except for user number sub-directories.

The files LFLINK.CMD, MSDOS.SYS and COMMAND.COM must be present on the system; the latter two must reside on the same drive. Any required MS-DOS application or utility should also be copied so it can later be accessed by MS-DOS. **THIS MUST BE DONE WITH THE TurboDOS COPY UTILITY BEFORE THE INSTALLATION PROCEDURE.**

Data printed by an MS-DOS application will be routed to a **printer** with or without spooling, according to the current TurboDOS configuration. Spooling, however, is an independent TurboDOS process and alters the disk allocation map. Therefore, if print spooling occurred in the MS-DOS directory, L/F-Link would not be aware of the allocation changes caused by the spool files. This is solved by using a pure TurboDOS disk (without MSDIR and MSFAT) as the spool disk.

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4.2   Recommendations

In a multi-user system, TurboDOS and MS-DOS software must be located on different logical drives. When someone is running software on the MS-DOS drive, no one using TurboDOS should access that drive. All MS-DOS files must be located on the same disk partition to avoid any directory misallocations.

It is recommended that two different user id and passwords be assigned to users who will be accessing both MS-DOS and TurboDOS and that the user be forced to logoff MS-DOS and log back onto TurboDOS with a different id. This can be accomplished if USERID.SYS is defined as follows:

<p align="center">USERID,PASSWORD,OP,D,LINK\DATE\LOGOFF.</p>

When the user logs on with user id and password, the system will automatically place the user on the "d" or MS-DOS drive and run L/F-Link. When the user uses the attention-abort sequence (shift-control @, control c) to exit MS-DOS, the system will ask "return to TurboDOS?". When the user responds Y(es), the TurboDOS system log on will appear "Enter user id". The user should then be instructed to enter his/her TurboDOS logon which will place the user on a different drive. This process allows the users to be conscious of being in TurboDOS and reduces the chance of making changes to the MS-DOS directory while other users are running MS-DOS applications. It also reduces the chance of an MS-DOS user executing a TurboDOS command while in MS-DOS which is likely to reset the local processor.

If the system manager would like an MS-DOS user to be logged onto the application that he/she will use automatically, this function can be added to the AUTOEXEC.BAT file in MS-DOS.

If the user chooses to use more than one disk partition for MS-DOS, L/F-Link will load all disks when anyone on the system types L/F-Link at the TurboDOS prompt.

It is recommended that the user run PROMPT pg so the current path will appear in the MS-DOS system prompt. PATH \ should be run also to access utilities in the root directory from any other directory. If no AUTOEXEC.BAT file exists when SETMS is run, it is automatically created with the commands: PATH \ and PROMPT pg.

4.3   Installing L/F-Link and MS-DOS

After logging onto your L/F Technologies - TurboDOS computer, follow the steps below. Do not attempt to do step 5 before completing steps 1 - 4.

STEP 1: Determine which disk the MS-DOS files will be loaded on. It is recommended that all MS-DOS files be loaded on the same disk.

STEP 2: Copy files from floppy to disk drive "d" or whichever drive has been selected for MS-DOS. (If floppy is an IBM PC-DOS disk, use the READPC command.)

STEP 3: List directory "d" to be certain that the necessary files are present. LFLINK.CMD, MS-DOS.SYS, COMMAND.COM and all MS-DOS software application program files must be present. All common programs should be located on user area "0".

STEP 4: Search all user areas of MS-DOS disk "d" and all user areas on the system boot disk for files named CON, PRN, AUX, NUL, COM1, COM2, LPT1, LPT2, LPT3. Any TurboDOS file having any of these names (with any extension) must be renamed. Failure to do this will cause disk allocation incompatibilities between TurboDOS and MS-DOS. (If you have elected not to dedicate one disk partition to MS-DOS files, a search of all disks and user areas would have to be done.)

STEP 5: When this is completed, type SETMS d at the TurboDOS operating system prompt (d=drive name). If there is more than one disk reserved for MS-DOS, type SETMS without designating the drive name and the system will request the drive(s) to set.

The SETMS utility will:

- create MS-DOS directory files on the designated disk or disks.

- automatically set file attributes MSDIR, MSFAT and MSDOS.SYS hidden under MS-DOS.

- set MSDIR, MSFAT, MSDOS.SYS, COMMAND.COM, AUTOEXEC.BAT and any user number sub-directory to global under TurboDOS.

- set LFLINK.SYS and COMMAND.COM to 'read-only' under TurboDOS to prevent accidental deletion.

- recreate MSDIR and MSFAT

- create MS-DOS sub-directories under user area 0:

- not delete sub-directories from other user areas.

4.4   Booting MS-DOS

After SETMS has been run successfully and you are sure that TurboDOS and MS-DOS directories are compatible, type LFLINK at the TurboDOS system prompt. The system will scan all directories until it finds a valid copy of MSDOS.SYS (the MS-DOS kernel); it then loads it and executes all required initialization and linking code, then it loads COMMAND.CMD (the MS-DOS console command processor) from the drive where MSDOS.SYS was found. If the system finds any directory inconsistency, it will display the message <DRIVE D ALLOCATION

MAP BAD - RUN SETMS>. After SETMS is run, the user should try to run L/F-Link again. If it still fails, delete MSDIR and MSFAT, run FIXMAP and try again. It should be successful. Changes that do not affect the block allocation are not diagnosed (renaming a file under TurboDOS). If in doubt, SETMS should be run.

If there is only one disk partition with L/F-Link, then LFLINK d: could be entered at the TurboDOS system prompt and only disk "d" would be searched for MSDOS.SYS.

L/F-Link automatically selects the current user-number subdirectory at boot time. This is performed by dynamically patching the AUTOEXEC.BAT file: a CD (user number) (or CD \ for user 0) command is inserted before its first line. The user can freely add or delete lines to the AUTOEXEC.BAT file, including the inserted CD command. This line will be re-inserted or deleted at the next boot.

4.5   L/F-Link SYSTEM OPERATION

It is the user's responsibility to run SETMS before typing LFLINK if any MS-DOS file was altered under TurboDOS. L/F-Link does not check this and MS-DOS will not be aware of disk allocation changes that may have occurred.

Upon successful completion of L/F-Link, the MS-DOS system prompt appears "d:\>" and any MS-DOS application (.EXE or .COM) can be run.

All MS-DOS initialization features, such as, AUTOEXEC.BAT, CONFIG.SYS file and user-defined drivers are fully supported.

MS-DOS users are immediately aware of any disk allocation or directory change performed by any of them. Therefore, it is safe, from the operating system point-of-view, to run simultaneously any number of MS-DOS applications under L/F-Link. However, since MS-DOS uses internal buffering, it is possible that data, already read by an MS-DOS application, can be altered by another user running the same application, without the first user being aware of this change. L/F-Link leaves it to the application developer or the user to force the MS-DOS application to flush MS-DOS buffers and lock the corresponding records.

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SECTION 5

QUICK L/F-Link INSTALLATION
&
MS-DOS BOOT

After logging onto your L/F Technologies - TurboDOS computer, follow the steps below.

Do not attempt to do step 5 before completing steps 1 - 4.

STEP 1: Determine which disk the MS-DOS files will be loaded on. It is recommended that all MS-DOS files be loaded on the same disk.

STEP 2: Copy files from floppy to disk drive "d" or whichever drive has been selected for MS-DOS. (Use READPC for IBM PC floppies.)

STEP 3: List directory "d" to be certain that the necessary files are present. LFLINK.CMD, MSDOS.SYS, COMMAND.COM and all MS-DOS software application program files must be present. All common programs should be located on user area "0":

STEP 4: Search all user areas of MS-DOS disk "d" and all user areas on the system boot disk for files named CON, PRN, AUX, NUL, COM1, COM2, LPT1, LPT2, LPT3. Any TurboDOS file having any of these names (with any extension) must be renamed. Failure to do this will cause disk allocation incompatibilities between TurboDOS and MS-DOS. (If you have elected not to dedicate one disk partition to MS-DOS files, a search of **all disks and user areas** would have to be done.)

STEP 5: When this is completed, type SETMS d at the TurboDOS operating system prompt (d=drive name). If there is more than one disk reserved for MS-DOS, type SETMS without designating the drive name and the system will request the drive(s) to set.

The SETMS utility will:
- create MS-DOS directory files on the designated disk or disks.
- automatically set file attributes MSDIR, MSFAT and MSDOS.SYS hidden under MS-DOS.
- set MSDIR, MSFAT, MSDOS.SYS, COMMAND.COM, AUTOEXEC.BAT and any user number sub-directory to global under TurboDOS.
- set LFLINK.SYS and COMMAND.COM to 'read-only' under TurboDOS to prevent accidental deletion.
- recreate MSDIR and MSFAT
- create MS-DOS sub-directories under user area 0:
- not delete sub-directories from other user areas.

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STEP 6: Type *LFLINK*

● **The welcome message appears.**

WELCOME TO:

"LFLink" - MASHOV TURBODOS ENHANCEMENT
MS-DOS 2.0 IMPLEMENTATION UNDER TURBODOS

(C) COPYRIGHT 1984 MASHOV SOFTWARE INDUSTRIES

MEMORY SIZE = 04000H PARAGRAPHS, 3635H FREE.
DRIVE D ALLOCATION MAP OK LOADING D:MSDOS.SYS...
MS-DOS version 2.00
Copyright 1981,82,83 Microsoft Corp.

LFLink REV 1.09 (14 MAY 85)
LOADING D:COMMAND.COM...
Command v. 2.02

D>CD \

D>path \

D>prompt pg

D:\>
D:\>

STEP 7: Return to TurboDOS - type *SHIFT-CONTROL @, CONTROL C.*

● **The following appears on the screen.** ↘

Return to TurboDOS (Y/N): type *N*

D:\>

Return to TurboDOS (Y/N): type *Y*

Date: 30 Jul 1985 Tuesday
Time: 12:00:00

System log on

Enter user id:

The process and computer messages for the SETMS utility are below.

0D]*SETMS*

"LFLink" UTILITY TO CREATE/UPDATE MSDOS DIRECTORY & FAT
(C) Copyright 1984 Mashov Software Industries Ltd.
Rev 1.08 - 13 May 1985

Enter drive(s) to set for MS-DOS: type   *D*

DRIVE D:
_____

LABEL: NO-LABEL

LOOKING FOR ACTIVE USER NUMBERS

(IT THEN QUICKLY FLASHES ALL THE FILES AND UPDATES THEM.)