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TITLE	PDP-8 DISK MONITOR - LAP6-DIAL INTERFACE
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PDP-8 DISK MONITOR - LAP6-DIAL INTERFACE

DECUS Program Library Write-up DECUS NO. 12-40

INTRODUCTION

This document describes a collection of programs intended to facilitate the operation of Disk Monitor and LAP6-DIAL at the same installation and to facilitate the communication of files between these two operating systems.

Why bother using Disk Monitor at all?

1. The DIAL and Disk Monitor editors are very different. Generally the DIAL editor is more convenient. However, for certain operations (e.g., moving lines around in your source program) the DIAL editing commands can become quite cumbersome and the Disk Monitor EDIT program may be much more convenient.

2. The PAL8 assembler is much more convenient for assembling certain types of programs - its conditional assembly statements are nicer than DIALs in that you never have to count lines and have an IFDEF pseudo-op. It has, of course, automatic off-page reference and literal generating capability. On the other side, it is difficult to assemble LINC code with it.

3. The Disk Monitor DDT program supports up to three breakpoints, which is two more than the powerful hardware debugging available on the PDP-12. Of course, both DDT and FETCH STOP, EXEC STOP can be used at once.

4. The large library of PDP-8 programs written for PAL-D often can be modified much more easily if you stick with the original language.

Using the set of programs described here you can do your editing under either or both systems, your assembling under either system (certain programs may be split and use both assemblers). The capability to rapidly load a disk monitor system is an integral part of this concept.

Minimum hardware configuration: PDP-12, teletype, 8K, 32K DF32 disk, LINCtape, VC12 display. Such a machine can definitely run DIAL-MS, but the programs in the collection described here work best if DIAL-V2 (all LINCtape, no disk operations performed) is run some of the time.

QANDA

These programs use QANDA for their teletype input. The QANDA used has been modified to recognize two new special characters: CTRL/D & CTRL/C.

CTRL/D - When this is typed during QANDA operation the DIAL system on LINCtape unit 0 is started by executing a 0701 7300 at 0016 in Segment 2. A DIAL-MS system will not be started correctly, since Disk Monitor is on the disk, but DIAL-V2 will be started up correctly.

CTRL/C - When this is typed during QANDA operation, the Disk Monitor system on the DF32 is started. The disk must contain the Disk Monitor if this procedure is to work. The procedure for loading the Disk Monitor is discussed later.

Allah help you is you violate the restrictions on these special characters while your LINCtapes are write enabled! An unknown program will be read from disk or tape and executed if you do.

QANDA is otherwise unmodified and operating procedure are best learned from DEC-12-FISA-D.

DISKIMAJ

DISKIMAJ is an entry in the DIAL index of the LINCtape on which these programs are supplied. It is entered as a source file starting at block 0. and 200 blocks in length. It is not really a source file, but simply an entry in the index whose purpose is to protect 200 LINCtape blocks against use by DIAL.

DISKIMAJ reserves a 200 block area on the LINCtape for the storage of an image of a 32K DF32 disk. The image on the LINCtape supplied is of a Disk Monitor System DF32. The image may be loaded onto the disk and a new disk image may be saved on the LINCtape using programs about to be described. The use of such a method to load a Disk Monitor System reduces the time required to get the system going with EDIT, PAL8, DDT, PIP, etc. to a couple of minutes.

The directory of the disk image on this LINCtape is listed below:

```
FB=0134

NAME   TYPE     BLK

8G
DUMP.SYS (0) 0002
PIP .SYS (0) 0025
LOAD.SYS (0) 0003
.CD..SYS (0) 0006
EDIT.SYS (0) 0016
PAL8.SYS (0) 0033
.DDT.USER(0) 0022
.SYM.USER(0) 0022
DDT .SYS (0) 0002
COMS.SYS (0) 0024
COPY.SYS (0) 0010
LD  .SYS (0) 0006
```

	SOURCE		BINARY	
NAME	BN	BLKS	BN	BLKS
PIP			247	21
COMS	646	64	573	14
DISKIMAJ	0	200		
LD	201	25	473	4
PAL8OPTD	477	4		
FRED	610	36	470	3
CREF12			503	7
DUMP	234	6	232	2

LD
Load Disk

ABSTRACT

LD is a program to rapidly load a 32K DF32 with a Disk Monitor system from LINCtape.

REQUIREMENTS

Storage

This program requires a PDP-12 with 8K of memory. It could be modified to run in 4K, but would be slower if it were.

Equipment

A PDP-12 computer with 8K of memory, LINCtape, 32K DF32 disk, teletype and VC12 display scope.

Software

All auxiliary software may be found on the LINCtape on which this program is supplied.

USAGE

LD can be run under either the Disk Monitor or DIAL operating systems. It is stored in both on the LINCtape containing these programs.

Loading

From DIAL: LO LD,u↵

From Disk Monitor: .LD ↵

Operating Procedures

The following QANDA display will immediately confront you:

```
LOAD-DISK:

TAPE DRIVE _
1ST TAPE BLOCK _ _ _
```

If you want to load the tape image on the tape supplied with this system ("DISKIMAJ"), just type the tape unit no. and Line Feed. (It is also possible to build up a collection of disk images, 4 to a LINCtape, and if this is done you will want to enter the optional 3 digit octal block no. - the default block no. is 0, which is where "DISKIMAJ" starts.) Any error in format will cause the initial display to be redisplayed.

The tape will spin and stop 5 times and then control will be returned to one of the operating systems, DIAL or Disk Monitor. Control is given to Disk Monitor if the left switches are set to 7600. Otherwise DIAL is started.

At the time control is returned to DIAL or Disk Monitor the DF32 contains the Disk Monitor system. Obviously DIAL-MS will not be correctly started at this point so the tape mounted on unit 0 should contain DIAL-V2 (the all LINCtape DIAL system) if you expect DIAL to be started.

EXECUTION TIME

A minute or two.

LISTING

The source file is included on the LINCtape; assemble it with DIAL.

DUMP

Save Disk Monitor on LINCtape

ABSTRACT

DUMP is a program to save an image of a 32K DF32 (with a Disk Monitor system) on LINCtape. It can store up to 4 such images on a standard LINCtape.

REQUIREMENTS

Equipment

PDP-12 computer, 4K, LINCtape, 32K DF32 disk, teletype.

Software

LD and Disk Monitor are found on the LINCtape supplied.

USAGE

DUMP runs under Disk Monitor. It is stored both as a DIAL and a Disk Monitor file on the LINCtape supplied.

Loading

Disk Monitor must be on the disk.

From DIAL: LO DUMP,u ↵

From Disk Monitor: .DUMP ↵

Operating Procedures:

DUMP does not use QANDA. Its input routine recognizes CTRL/C, but not CTRL/D. Upon loading DUMP will immediately ask you (via TTY): "SEG-". answer "0", "1", "2", or "3" depending on where on the LINCtape you want to save the disk image (usually "0") - see Special Formats below.

Next DUMP will ask you: "UNIT-" ; only tape units 0 and 1 are valid. The tape will spin and spin. Finally control is returned to Disk Monitor.

EXECUTION TIME

About 5 minutes

SPECIAL FORMATS

As you have learned, on the LINCtape provided, a disk image has been saved in blocks 0-177. This is done by specifying "0", when DUMP asks you "SEG-". You may find it desirable to put more than one image on a LINCtape; DUMP handles up to 4 such images as follows:

SEG-	Tape Blocks Used
0	0-177
1	200-377
2	400-577
3	600-777

A LINCtape with Disk images in SEGs 1 or 2 cannot also contain a DIAL system. DUMP does not write on any tape blocks except those in the SEG specified (i.e., it does not attempt to make entries in a DIAL directory in any event).

LISTING

DUMP's source file is included on the LINCtape. It may be assembled with DIAL.

COMS

File Communication Between DIAL and Disk Monitor

ABSTRACT

This program greatly facilitates file communication between PDP-8 Disk Monitor and LAP6-DIAL. Files are transferred directly from the disk to LINCtapes. ASCII files may be passed in either direction so that either symbolic editor may be used for preparing programs and either assembler may be used for assembling them. Binary files may be passed in one direction, from Disk Monitor to DIAL. The Disk Monitor "SAVE" command may be used to pass binary files in the other direction.

REQUIREMENTS

Storage

This program requires a PDP-12 with 8K of memory. It probably could be modified to fit in 4K.

Equipment

A PDP-12 computer with 8K of memory, LINCtape, 32K DF32 disk (see section on Further Restrictions), teletype and VC12 display scope.

Software

PDP-8 Disk Monitor, LAP6-DIAL and any other requirements are on the LINCtape on which this program is supplied.

USAGE

COMS is a program for file communication between two operating systems (DIAL and Disk Monitor). Figure 1 shows the means by which source and binary files may be transferred from Disk Monitor to DIAL and vice versa without using COMS. Using PIP and paper tape this way is very undesirable - before long you would be up to your neck in paper tape! In contrast, notice how easily Load and Go (binary) DIAL files can be transferred to the Disk Monitor; such a program is loaded and started under the DIAL system while Disk Monitor is on the DF32. The program itself is used to start the Disk Monitor by typing CTRL/C. Then the program may be saved on the disk by use of the Disk Monitor "SAVE" command (see DEC-D8-SDAB-D, section 2.6). Certain obvious restrictions regarding restart ability and recognition of CTRL/C must be observed in coding the program, but these are usually just good programming practices. This is an excellent way of communicating DIAL binary files to the Disk Monitor and it has not been replaced by any part of the COMS program.

Figure 2 shows how COMS facilitates file communication between the two operating systems. Paper tape is entirely eliminated and ASCII files go directly to the other system. Binary files make an intermediate stop, either in core (see preceding paragraph) or in the DIAL binary work area on LINCtape unit 1.

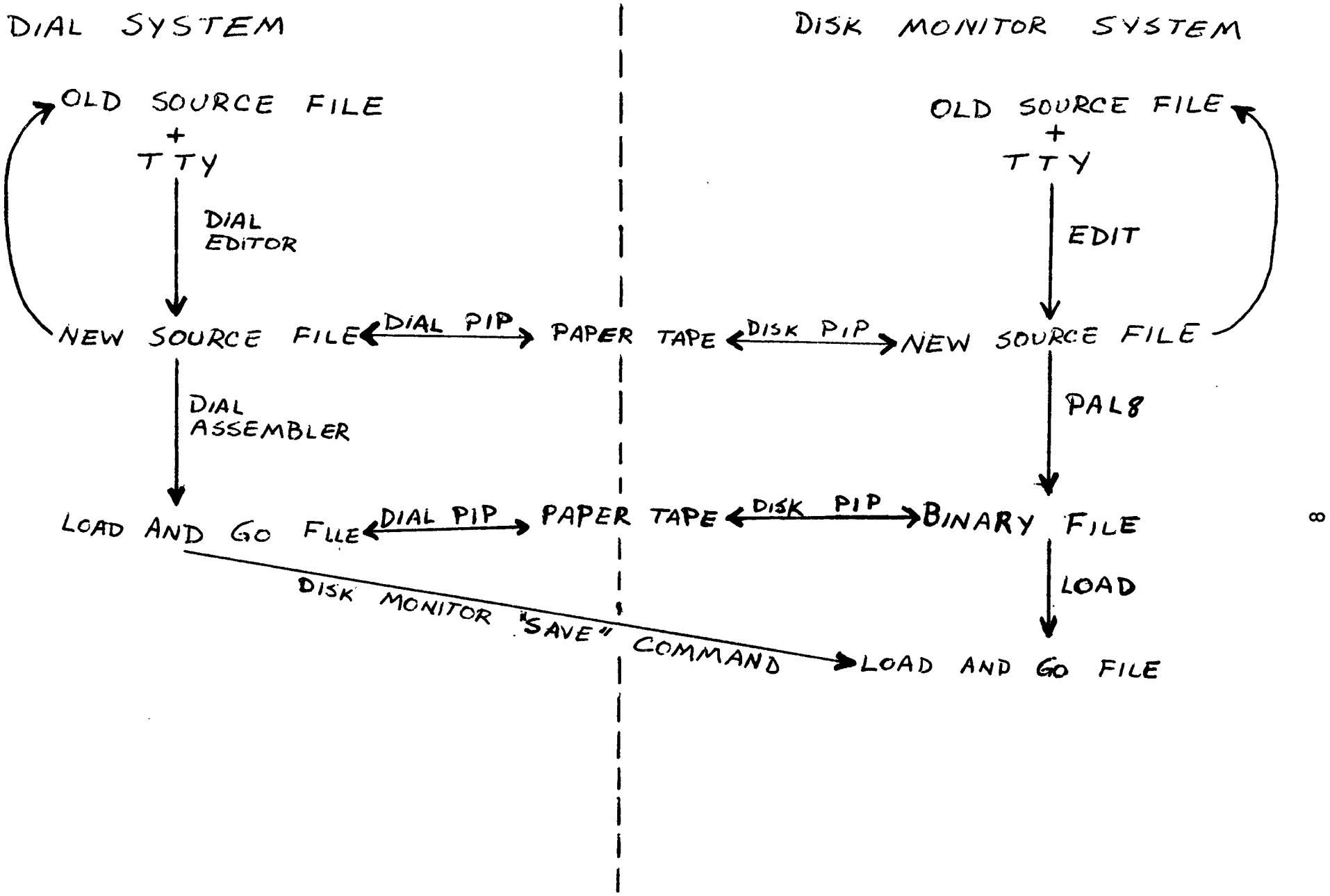

FIG. 1 INTERACTION BETWEEN DIAL AND DISK MONITOR WITHOUT COMS

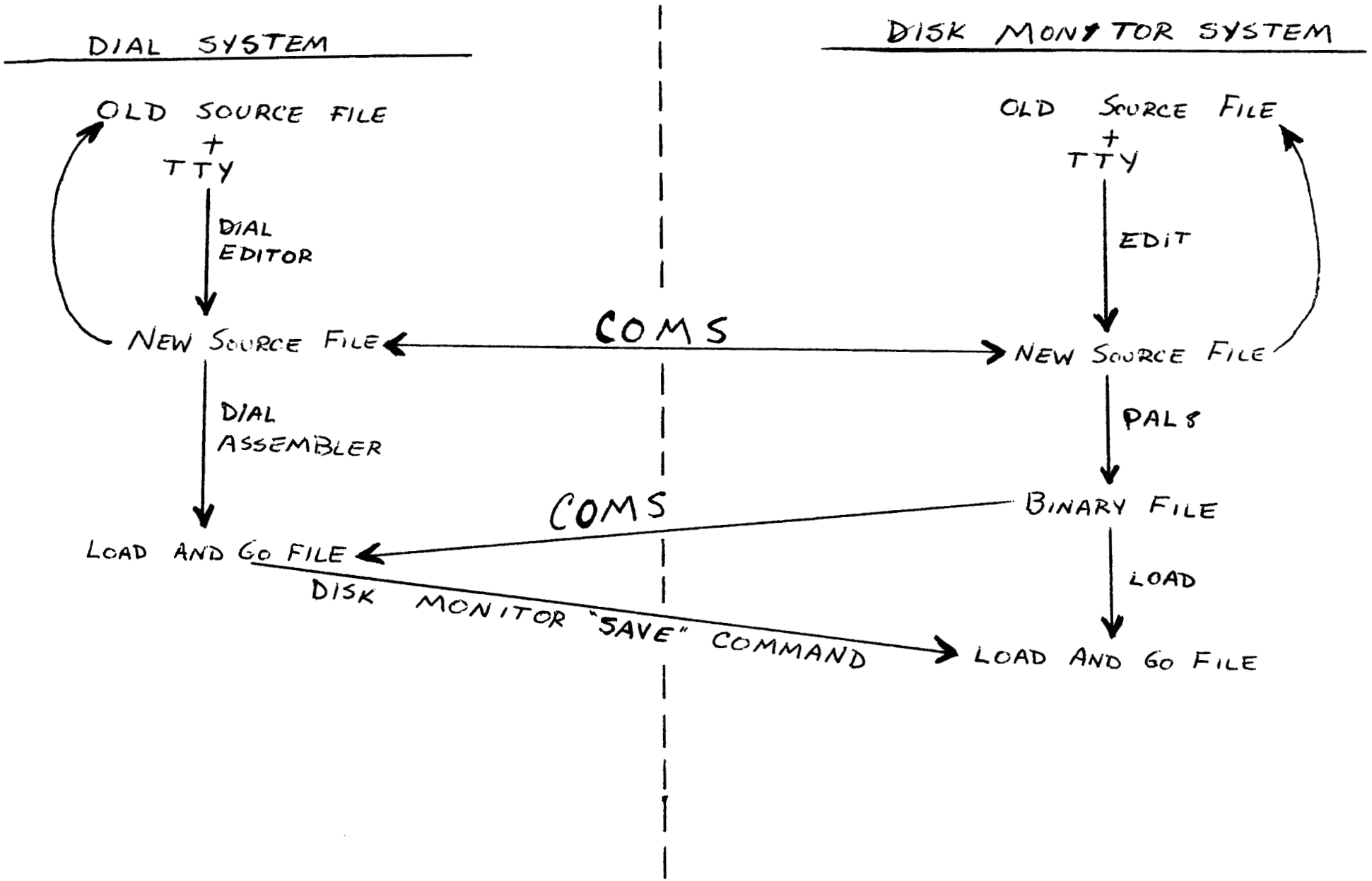

FIG. 2 INTERACTION BETWEEN DIAL AND DISK MONITOR WITH COMS

Loading

COMS may be loaded under either the DIAL system or the Disk Monitor system

LAP6-DIAL	Disk Monitor
LO COMS u ↵	.COMS ↵

The procedures for saving COMS on the Disk Monitor system are in section "Saving COMS on Disk Monitor."

Operating Procedures

The following QANDA display will immediately confront you:

```
INPUT SOURCE (L OR D) _
FILE TYPE (S OR B) _
DIAL FILENAME (U:NAME) _ _ _ _ _ _ _ _ _ _
```

To the first question answer LINCtape or Disk depending on where the file is to be found. To the second question answer Source or Binary depending upon what type of file you are dealing with. To the last question answer with the unit number, a ":", and the name of the file to be read or written on the DIAL tape.

If your input source was LINCtape ("L", above), then your output device is the disk and the Disk Monitor Command Decoder (.CD.) will ask you "OUT-". The only valid device is the system device, "S:". Answer this query "S:NAME" where NAME is the four character filename of your Disk Monitor output file.

The Disk Monitor Command Decoder will ask you "IN-". If you already answered "OUT-" (see above), just type a carriage return. (.CD. always asks for an input file). If the input file comes from the disk, type "S:NAME" where NAME is the name of the input file.

The file transfer is made and the program returns to the QANDA display above.

ERRORS

A variety of errors may occur and are dealt with as follows: All syntax errors in your QANDA answer or device to the Command Decoder cause the program to return to the initial QANDA display. When .CD. detects an error (i.e., you name a nonexistent input file) it returns you to Disk Monitor.

Other errors (full devices, etc.) cause an appropriate error message (e.g., "DISK TOO FULL!") to be displayed $1,000_{10}$ times and then return to the initial QANDA display. You will have enough time to read the error message if you are watching the computer.

If you load COMS from DIAL, Disk Monitor must already reside on the DF32 disk, or you will never reach the initial QANDA display.

EXECUTION TIME

Execution time depends on the file length and type. The program is limited by the speed of the LINCtape.

SPECIAL FORMATS

The Disk Monitor ASCII format can represent 64 more characters than the DIAL source format (see DEC-D8-SDAB-D, appendix B.2 and DEC-12-SE2B-D, appendix C.3). Characters which cannot be represented in DIAL and which are in the "non-printing" range (200-237 and 340-377) are not sent to DIAL - they are "lost" by COMS. Line Feed, which can be represented as a "37", but is unnecessary (and, in fact, causes big problems for the DIAL editor's display routine), is also lost.

Character ("#" and "'") which print and are not represented by DIAL are replaced with a "?". The character "←" which seems to be handled correctly by DIAL except as the first character on a line (which it very, very seldom will be in a source program) is sent to the DIAL file unchanged ("37"). The DIAL editor displays it on the scope as " —>".

The DIAL editor chokes on the blank line. Such a line causes the editor to display a "?" at the beginning of the following line, but doesn't delete or otherwise change the blank line. DIAL will correctly display a line with just a single space in it.

In summary of the source file discussion, if you want to use DIAL to edit your Disk Monitor source files, you have to abide by the same syntax restrictions you have already learned to live with in working with the DIAL operating system.

Disk Monitor binary file structure is described in DEC-D8-SDAB-D, appendix B.2. Such files are first loaded into the DIAL binary work area and then saved in the file named in the initial QANDA display. The binary work area is zeroed (as in the DIAL-MS "ZE" command) before loading into it, so no overlaying may be accomplished until you return to the DIAL-MS system with its "AB" command. The binary files saved on the DIAL tape do not self-start (again, "AB" may be used and then a new "SB" with load and go arguments to make self-starting binary DIAL files).

Programs which use more than 8K cannot be loaded with the DIAL system and such programs are detected by COMS while they are being loaded into the binary work area and are not stored into the DIAL file you named in the QANDA display. (The error message is "8K EXCEEDED!".) If the checksum for the Disk Monitor binary file does not check, the error message is 'BAD BIN CHECKSUM!" and, of course, the file isn't written onto the DIAL tape.

FURTHER RESTRICTIONS

COMS as written will not work with a Disk Monitor System for a disk bigger than 32K. It detects such disk systems and halts. Some indications of the modifications needed to adjust COMS to a bigger disk are made in the source program. Mainly these are things which could not be debugged on a 32K disk system. I have some confidence that if you load DISKIMAJ onto a larger disk that it will run precisely as though it were still on a 32K disk.

SAVING COMS ON DISK MONITOR

This is something you shouldn't need to do since it is already on the disk image provided.

COMS uses FRED in Segment above, but for loading purposes under Disk Monitor, it is convenient to have FRED in a buffer in FIELD 0 and move it into place when we start up. The buffer is later used for the Disk Monitor Command Decoder, so the move operation cannot be repeated on successive restarts. Looking at the listing of COMS about line 3100, you will see that the LDF 7 at "IISW" is modified on the first time through.

Procedures for saving COMS on Disk Monitor then, are as follows:

1. Load COMS from a DIAL tape. Initial QANDA display should appear.
2. Set left switches to 4056 and IF switches to 0.
3. Press FETCH STOP. Computer will immediately halt.
4. Set left switches to 4041 and press EXAM. MB register should show 6051.
5. Set right switches to 0647 and press FILL.
6. Set left switches to 4056, again.
7. Press START LS. IR should show 0456.
8. Turn FETCH STOP off.
9. Press CONTINUE. Initial QANDA display should reappear.
10. Type CTRL/C. Carriage Return, Line Feed, "." should be typed.
11. Type "SAVE COMS!0-777, 2000-4530, 5000-5777; 200 ↓".

LISTING

The source file is included on the LINCtape; assemble it with DIAL.