

Product: FLEX™ version 2.7:3 and subsequent versions of FLEX 2.7
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Proper FLEX™ Disk Driver Operation

The disk drivers implemented in FLEX™ version 2.7 have been optimized for use with the SWTPC DMF2 and DC4 disk controllers attached to drives with 3 millisecond step times. These drivers may not function correctly with older controllers or drives, and must be modified if they are to be used on the older equipment. This note describes how to modify FLEX™ version 2.7 for use with DMF1, DC2, or DC3 disk controllers and Calcomp 143 or Shugart SA-400 disk drives. This version of FLEX™ should not be used with the SWTPC DC-1 disk controller.

When FLEX™ is initially booted from disk, special bootstrap disk drivers are brought in from the first few sectors on the disk. These drivers will function with any of the above configurations of equipment, thus allowing FLEX™ to be booted on older equipment. These drivers are discarded after the bootstrap process is complete. Hence, in order to properly run commands after booting, the drivers present in FLEX™ itself must be modified. In order to do this, a two-step process is necessary.

First, once FLEX™ is booted and the "+++" prompt is present, the MON command is used to return control to the ROM monitor. (If the message "-- Can't run STARTUP file." appears, it should be ignored.) The memory examine and change function of the monitor is then used to alter the copy of the FLEX™ disk drivers resident in memory.

Second, the FIX command is then used to alter the copy of the drivers in the FLEX.SYS file on disk. The altered copy of FLEX is then connected to the bootstrap with the LINK command. Once these changes are made, the altered FLEX™ may then be booted and used normally.

To perform the first step of this alteration, boot the FLEX™ 2.7 disk and enter the date as requested. Then enter the ROM monitor from FLEX™ using the MON command as follows:

```
+++MON
- SP=C073 US=BFFC DP=00 IX=1234 IY=5678
- PC=D34C A=00 B=00 CC: E - - - - -
>
```

Select the modifications appropriate for your hardware configuration from those described below. Make the modifications to the drivers already resident in memory by using the ROM monitor. Then return to FLEX™ from the monitor by typing "G".

At this point, the disk drivers that have been loaded into memory have been modified, but the copy on disk in the FLEX.SYS file is still

in its original condition. Use the FIX command to modify FLEX.SYS as follows:

```
>G
+++FIX FLEX.SYS
```

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The same modifications made to the drivers in memory must now be repeated to change the copy of the disk drivers in the FLEX.SYS file. When this has been done, exit from the fix command by typing "e". The modified FLEX.SYS file must be re-linked to the bootstrap process by using the LINK command:

```
:e
-- Fix complete.

+++LINK FLEX.SYS
+++
```

The following descriptions detail the changes that must be made to the FLEX™ disk drivers for each piece of equipment to be used. If a combination of equipment is used, the changes for BOTH types must be made. For example, if you wish to use a DC-3 disk controller with SA-400 disk drives, you must make both sets of changes to correctly modify the FLEX™ for normal operation.

NOTE: The addresses specified below are correct for FLEX™ 2.7:3. The same modifications may be made to subsequent versions of FLEX™ 2.7, but the addresses may not be correct. If that is the case, the object code in the vicinity of the specified addresses should be examined to locate the bytes that must be changed.

(1) The following change must be made to use Calcomp 143, 8-inch drives. (To use the Calcomp 143 drives with the DMF2 disk controller the hardware changes described in Modification/Application Notice 102 must be made.) The combination of the DMF1 and Calcomp 143 hardware does not require this change. This change doubles the amount of time allowed for a step to complete.

change the byte(s) at	DEEF	from	86 18	to	86 19
	DEF1		B7 F0 20		B7 F0 20
	CBOF		86 08		86 09
	CB11		B7 F0 20		B7 F0 20

(2) The following change must be made to use the DMF1 disk controller. This change disables the driver's use of the extended address hardware present on the DMF2 controller.

change the byte(s) at	DE65	from	8A 16	to	8A 16
	DE67		B7 F0 40		12 12 12

(3) The following change must be made to use the DC2 disk controller. This change causes the head load timer to be used for all disk operations. (The drivers normally use the head load timer only after seek operations.)

change the byte(s) at	DE2F	from	BA DE 1E	to	BA DE 1E
	DE32		BA DE 20		8A 04 12
	DE8B		BA DE 1E		BA DE 1E
	DE8E		BA DE 20		8A 04 12

(4) The following change must also be made to use the DC2 disk controller. This change disables the driver's use of the drive ready indication available on the DC3 and DC4 controllers.

change the byte(s) at	CB72	from	21 10	to	20 10
	CB74		8E 49 B3		8E 49 B3
	CBB2		21 D0		20 D0
	CBB4		8E 0B 0E		8E 0B 0E

(5) The following change must be made to use DC2 disk controllers or DC3 disk controllers. This change disables the driver's use of the double density hardware present on the DC4 controller.

change the byte(s) at	DF62	from	21 14	to	20 14
	DF64		A7 E2		A7 E2

(6) The following change must be made to use the Shugart SA-400, 5-inch drives. This change increases the amount of time allowed for a step to complete.

change the byte(s) at	DF39	from	86 18	to	86 1B
	DF3B		B7 E0 18		B7 E0 18
	CB15		86 08		86 0B
	CB17		B7 E0 18		B7 E0 18

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