

UniFLEXTM Operating System



UniFLEX™ Operating System



technical systems
consultants, inc.



technical systems consultants, inc.

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Dear Customer,

Congratulations! You have just purchased the most advanced, state-of-the-art operating system available for the 6809 microprocessor... "UniFLEX™". To our knowledge it far surpasses any operating system for any microcomputer that is commercially available today. Before jumping into the software, take a moment to read this letter to be sure you received everything you should have and that your software is properly registered.

First of all be absolutely certain that you have filled out and signed the "Binary Software License Agreement". If you purchased this software directly from Technical Systems Consultants, Inc, this form should have been previously mailed to you and by now returned. If purchased from a dealer, the form should have been filled out and given to the dealer for forwarding to us. You should personally see that the dealer forwards the form to us promptly. Absolutely no registration, maintenance, or support will be provided until we have the form in hand.

You should have received a floppy disk sealed in a plastic bag. Do not open this bag until you are certain everything is in order. Once this bag has been opened, we cannot accept returns. At a minimum, read the UniFLEX General Notes section at the front of the manual and the UniFLEX Hardware Setup Guide to be certain your system is capable of supporting the software before opening the sealed bag. The looseleaf notebook should contain several manuals as described in the General Notes section. You may find that some of the manuals are not presently included. The intent is to satisfy those who cannot wait to start using UniFLEX (and there are a lot of you) but who can wait for certain documentation which is not essential for normal operation of the software. Please do not call us about availability of these manuals. If you have purchased maintenance, you will be automatically notified. You should also find the following documents in the inside front cover pocket of the notebook:

- Hardware Setup Instructions
- Problem Report Forms
- UniFLEX Suggestion Form

If any of these items have been omitted in your package, please contact our order department immediately.

One final comment. UniFLEX is an extremely powerful operating system and is consequently quite complex. The person or persons in charge of implementing it on your hardware should comprehend this fact and fastidiously read and closely follow the documentation supplied with the system.

Now go to it! We hope you appreciate and enjoy the facilities of UniFLEX as much as we do.

Technical Systems Consultants, Inc.

Documentation Changes for X.09 Releases of UniFLEX™ for SWTPc
Technical Systems Consultants, Inc.
July 28, 1983

This package of documentation contains the changes necessary to bring your UniFLEX manual up-to-date. Except for the product bulletin (U-EP0002), the attached sheets are all revised or additional documentation for the "UniFLEX Utility Commands" portion of the UniFLEX manual. All existing documentation relating to included commands should be discarded and replaced by the enclosed documents. The product bulletin on removal of spoolers may be added to the "Miscellaneous UniFLEX Documents" portion of your UniFLEX manual.

A change has been made in the version number scheme for the UniFLEX Operating System. Version numbers are of the form "XX.YY", where "XX" is a number that indicates which hardware the system runs on and "YY" is a number that indicates the release version. The "XX" portion will not change; the "YY" portion will change with each update or release of UniFLEX. The following numbers are current for SWTPc hardware:

UniFLEX Part No.	CPU	Disk	Version
-----	-----	-----	-----
UOS-S1	MP/09 (or S/09)	DMF-2	1.09
UOS-S2	MPU-1 (or S+)	DMF-2	2.09
UOS-S3	MP/09 (or S/09)	DMF-3	3.09
UOS-S4	MPU-1 (or S+)	DMF-3	4.09

The X.09 version of UniFLEX contains one new utility, "diskrepair". This is a utility to check and optionally repair inconsistencies in the structure of a UniFLEX disk. The enclosed document on its use should be included in your "UniFLEX Utility Commands" manual. While we have debugged this utility as fully as possible, you should be aware that it is a new piece of rather complicated software. If you repair a disk that has numerous problems, it may be advisable to then run "diskrepair" a second time to ensure that the disk is indeed completely repaired. We do not know of any problems in "diskrepair", but we cannot be held responsible for any loss of data incurred in the use of this utility.

A few changes have been made in the booting process for UniFLEX. This has required a new boot program on the disk (not the boot program in the UniBUG ROM). If you upgrade your system by starting from scratch, the new format programs will install the proper boot program. If, however, you attempt to upgrade an existing system disk without reformatting the disk, you will need to install a new boot sector on the disk. This is easily accomplished by running one of the new format commands on the disk with a "+B" option. This option tells the format program to only write the boot sector--it will not actually format the disk.

UnifLEX™ HARDWARE SETUP INSTRUCTIONS

For SWTPc S/09 and SWTPc S+ Versions

October 4, 1982

Important Note A

The standard version of UniFLEX for the SWTPc is setup to perform 3 millisecond track seek operations on 8" floppy disk drives. This is compatible with Qume and Remex drives. If your disk drives use slower seek rates, such as Calcomp drives, you will require a special version of UniFLEX. If you do have slower floppy disk drives and the supplied UniFLEX disk packet does not specifically state a seek rate (ie. "6ms seek"), you should return it unopened for a version with slower seek commands.

Important Note B

If questions arise as to whether the particular revisions of hardware you own are compatible with UniFLEX or whether modifications will be required, you should directly contact the hardware manufacturer. They should be able to inform you of compatibility and provide you with modification instructions if required. Their address is:

Southwest Technical Products Corp.
219 West Rhapsody
San Antonio, TX 78216
USA
Phone: (512) 344-0241

I. HARDWARE REQUIREMENTS

The standard version of UniFLEX for SWTPc's S/09 or S+ computer as supplied on the distribution disk requires the following hardware at minimum:

- 1) S/09 or S+ computer mainframe
- 2) 6809 cpu card (MP-09B for S/09 or MPU-1 for S+)
- 3) UniBUG ROM monitor for S/09 or UniBUG II for S+
- 4) 128K of RAM (ie. one 128K card or two 64K cards)
- 5) 8" Floppy Disk System (DMF-2 or DMF-3) with at least 1 drive
- 6) One serial interface card
- 7) One CRT terminal with lower-case capability

The following optional hardware is also supported:

- 1) Additional RAM
- 2) Additional serial interface cards and terminals
- 3) A serial or parallel interfaced printer (or both)
- 4) A NEC Spinwriter daisywheel printer from SWTPc
- 5) SWTPc's CDS-1 or CDS-2 hard disk system
- 6) SWTPc's DMF-3 Mini Winchester Hard Disk

Details of requirements for this hardware and proper setup of each component follows.

II. SPECIFIC COMPONENT REQUIREMENTS AND JUMPER SETTINGS

In the following descriptions, mention is made of dip switch settings for various boards. All settings are referred to as "on" or "off" which corresponds to "closed" or "open" circuits. If no jumper setting is specified for a particular jumper on a board, it should be assumed that that jumper setting may be selected by the user without affecting the operation of UniFLEX. An example is baud rate jumpers.

A) 6809 CPU Card

For the S/09 system, the cpu card must be SWTPc's MP-09B model or later. The SBUG-E monitor ROM must be replaced with a UniBUG ROM.

<u>Jumper</u>	<u>Correct Setting</u>
2S / 3S	3S
110 / BR	BR
BA / BA&BS	BA

The S+ system uses the MPU-1 cpu card which has no jumper settings relevant to UniFLEX. The UniBUG II ROM is required.

B) MP-ID Card in the Mainframe

The standard SWTPc computer includes an MP-ID card as part of its mainframe. This card is required by UniFLEX and should be setup as follows.

<u>Jumper</u>	<u>Correct Setting</u>
NOR / SLOW PER	NOR (except with MP-S4 use SLOW)
56-64 / 48-56	56-64
0-7 select	#0 for S/09, #5 for S+
X1 / X8	X1
EX / INT	INT
PIA IN / PIA OUT	PIA OUT

C) RAM Memory

The system should contain at least 128K of RAM. 4K of this RAM must be physically addressed at location \$00000. The remaining RAM may be physically addressed to any locations except the upper 8K of each 64K section (of course no memory should overlap).

SWTPc 128K RAM Memory Cards:

If using SWTPc's 128K RAM memory cards, the first 128K card installed in the system should have the following switch settings.

<u>Dip Switch Number</u>	<u>Correct Setting</u>
1	off
2	off
3	on
4	off
5	off
6	on
7	off

The second 128K RAM memory card installed in the system should have the following switch settings.

<u>Dip Switch Number</u>	<u>Correct Setting</u>
1	off
2	on
3	off
4	off
5	on
6	off
7	off

D) DMF-2 Disk Controller Board

If using the DMF-2, the controller board must be "Revision A" or later. Necessary modifications to implement revision A are available from SWTPc.

<u>Jumper</u>	<u>Correct Setting</u>
HALT / BUS REQ	BUS REQ
UPPER / LOWER	LOWER
BA / BA&BS	BA&BS
IRQ / NORM	IRQ
56K / 32K	56K
MR / NORM	MR
NORM / PRECOMP	PRECOMP
DESEL / SEL	SEL
0-7 select	position #4

E) DMF-3 Disk/Tape Controller Board

The DMF-3 controller board should have the jumper settings shown below. There are two "20/16" jumpers, and both should be set to "20".

<u>Jumper</u>	<u>Correct Setting</u>
20 / 16	20
PRECOMP / NON	PRECOMP
5 / 8	8

The dip switch should be configured as follows:

<u>Dip Switch Number</u>	<u>Correct Setting</u>
1 (A8)	on
2 (A9)	on
3 (A10)	on
4 (A11)	on
5 (A12)	off
6 (A13)	off
7 (A14)	off
8 (A15)	off

F) Floppy Disk Drive Units

The floppy disk drive units attached to the controller board are assumed to be capable of 3 millisecond track seek operations. Qume and Remex drives are capable of 3 ms seeks and are directly compatible with the standard version of UniFLEX. If you have Calcomp drives in your system (which are only capable of 6 ms seeks), you will have to have a version of UniFLEX that has been assembled for these slower seeks. If your distribution UniFLEX disk is not marked as being a 6ms version, you should return it to Technical Systems Consultants, Inc, for a 6ms copy.

G) Serial Interface Card(s)

Depending on the version of UniFLEX you have, your system will support either the SWTPc MP-S2 2-port serial cards or the MP-S4 4-port serial cards, but not both. At least one card is required and must be installed in I/O slot #0 (first ACIA addressed at \$E000) for the system manager's booting terminal. Additional cards (optional) should be placed in consecutive slots through slot #5 for MP-S2's or slot #4 for MP-S4's. Since each MP-S2 has 2 serial interfaces, this implies a maximum of 12 user terminals in this configuration of UniFLEX. With MP-S4 cards, up to 18 terminals can be supported. Slot #6 has been reserved for the NEC Spinwriter interface. If using MP-S2 interfaces, two serial printers for print spooling may be established by inserting an MP-S2 in I/O slot #7 (ACIA's addressed at \$E070 and \$E074). If using MP-S4 interfaces, the two printers should be connected to the third and fourth ports on the card in I/O slot #4.

H) Terminal(s)

UniFLEX can support up to 12 user terminals with MP-S2 interfaces and up to 18 with MP-S4 interfaces. The only required terminal is the one used by the system manager to boot UniFLEX and must be a CRT device with lower-case capability. All other terminals can be just about anything but should preferably have lower-case capability. ALL TERMINALS SHOULD BE RUN AT RATES OF 1200 BAUD OR LESS! The importance of this rule must not be overlooked. Running a terminal at 9600 baud in a system such as this, where every character which is input or output causes an interrupt requiring service by the main cpu, creates extreme overhead and greatly reduces the system's efficiency in performing normal processing and disk I/O. This is not a limitation of the operating system, but rather a limitation of the hardware which could only be overcome by some sort of I/O preprocessor. To drive this fact home, consider that one terminal running at 9600 baud creates the same system loading as eight terminals running at 1200 baud. If you don't believe it, try it! Remember, for the best operation of the system overall, keep the terminal speeds as low as possible.

I) Printers (Optional)

The standard version of UniFLEX contains device driver routines for one parallel, two serial, and one NEC Spinwriter printers.

The serial printer drivers expect the printers to be connected to an MP-S2 serial interface card in I/O slot #7 (ACIA's addressed at \$E070 and \$E074) or to the third and fourth ports of an MP-S4 serial interface in I/O slot #4. The parallel printer driver expects the printer to be connected to the standard parallel port supplied on the MP-ID card in the S/09 or S+ system. The NEC Spinwriter is connected to the system via an MP-QP interface card inserted in slot #6. Any or all of these printers may be optionally included in your system hardware.

J) CDS-1 or CDS-2 Hard Disk System (Optional)

The standard version of UniFLEX for SWTPc includes provisions for mounting the SWTPc CDS-1 or CDS-2 hard disk into the system. If you do include the CDS in your system, be certain that you have installed a new UniFLEX compatible controller ROM on the controller board found inside the drive cabinet itself. This ROM is available directly from SWTPc. You may also need to obtain a hard disk format routine from SWTPc. The HD controller board which plugs into the computer should be configured as follows.

<u>Jumper</u>	<u>Correct Setting</u>
HALT / BUS REQ	HALT
BS 00 / BS 09	BS 09
IRQ / FIRQ	IRQ

<u>Dip Switch Number</u>	<u>Correct Setting</u>
1	off
2	on
3	on
4	on
5-8	all off

III. HARDWARE LIMITATIONS

There are certain limitations or characteristics of the system which are hardware imposed. Some of these points are brought out in other documents, but are emphasized here so that the novice to UniFLEX will not expect things which are not feasible due to hardware.

A) System Protection

In the S/09 there is no hardware distinction between a user state and a system state. This means that the memory mapping registers are always accessible, even to the user. It is therefore possible for a user to write into the memory area where those mapping registers are located (the upper 256 bytes of the 64K address space) and thereby have access to any memory in the system. The implications are that a user could read or write any of the RAM in the system and could very easily wipe out the entire system. There is simply no way around this lack of protection with the existing S/09 CPU card.

The S+ system gets around this problem. It is fully protected and no user task should be able to do anything which will crash the system.

B) Swapping on Floppy Disks

UniFLEX permits swapping on any block device with appropriate drivers and formatting routine. In the supplied versions, this implies swapping on either a hard disk or 8" floppy. Swapping works quite well on the hard disk, but is not at all efficient on floppy disks. They are simply not fast enough for efficient swapping. It is permitted, however, and does work. In certain environments it may be suitable, and it is certainly better than no swapping at all! Alternatives are to add a hard disk or up the amount of memory in the system such that less swapping is required.

C) Number of Users

There are few real limitations in the UniFLEX software as to the number of users which can be on-line. The main limitation is the speed of the 6809 processor itself. This is not to imply that the 6809 is a slow or inefficient processor, indeed we feel it is the best 8 bit processor on the market. It is just that there is a limit to what an 8 bit microcomputer can do. We have found that many people expect to be able to efficiently run as many as 32 users under UniFLEX when that is really not practical for the 6809 or any 8 bit microprocessor. Many of today's minicomputers do not even support that many users!

We have imposed a limit of 12 users with MP-S2 serial interfaces and 18 users with MP-S4 interfaces. This is essentially all that the motherboard will support and we feel is a typical limit for a useable implementation of UniFLEX. Of course it really depends on what each user is doing, what resources are in the system, and what kind of response times you require. Certain environments where processor loading is small and where response times are not critical, such as educational or word processing systems, may permit even more users.

It has been our experience that if more than 2 or 3 users are running large tasks which make heavy demands on the system, a minimal configuration is not sufficient. Under these conditions, it is highly recommended that the system include at least 256K of RAM and a hard disk for swapping.

D) Terminal Speeds

As previously pointed out, fast terminal baud rates are murder on the system's efficiency. The S/09 and currently the S+ do not have I/O preprocessing (we know of no microprocessor based systems that currently do have) which implies that every character which is input or output to a terminal causes an interrupt which requires the user to be mapped out, the operating system mapped in, the character input or output performed, the operating system mapped back out, and the user mapped back in. You can see that

this is a tremendous imposition on the cpu. If several fast terminals are in use, the cpu will spend most of its time processing terminal I/O and seldom have a chance to perform actual processing or disk I/O. By slowing down the terminals you smooth out the rate of interrupts to the system instead of having bursts of constant interrupts. This makes output look much smoother and gives the processor a chance to put in a little time on other tasks. Again, keep the terminal speeds at 1200 baud or lower.

IV. SUPPLIED UniFLEX CONFIGURATIONS

There are either two or three versions of UniFLEX supplied on the distribution diskette. They each contain a different configuration of the operating system. Before we get into the specifics of these versions and how to employ them, we must define the various devices which can be connected to the system and the software drivers for these devices. All serial and parallel I/O devices are shown based at address \$E000. These are true addresses for the S/09 version, but the S+ version I/O is based at \$E400. Thus for the S+ version you must add \$0400 to each address shown to obtain the actual hardware address.

A) UniFLEX Device Drivers

Under UniFLEX, each external I/O device is driven by a set of software routines called the "device drivers". The device driver for each I/O device or unit has a unique name given to it. Actually, these device drivers are treated much like files and are given names like any file. You can observe them in the directory "/dev". A list of device drivers supplied in the standard versions of UniFLEX is given here.

<u>Device Name</u>	<u>Device Description</u>
fd0	8" floppy disk drive #0
fd1	8" floppy disk drive #1
hd0	CDS-1 or CDS-2 hard disk unit
w0	DMF-3 Mini Winchester hard disk
tty00	Serial terminal at \$E000
tty01	Second serial terminal
tty02	Third serial terminal
tty03	Fourth serial terminal
.	.
.	.
ttyXX	Last terminal (XX=11 w/ MP-S2; XX=17 w/ MP-S4)
spr	First serial printer
spr2	Second serial printer
nec	NEC Spinwriter on I/O slot #6
ppr	Parallel printer on MP-ID card

If using MP-S2 serial interfaces, the terminal device drivers tty00, tty01, tty02, ..., tty11 are for terminals connected to ACIA's in MP-S2 cards in slots #0-A, #0-B, #1-A, ..., #5-B. If using MP-S4 interfaces, the first four terminals should be connected to an MP-S4 in I/O slot #0, the next four in slot #1, etc. The first terminal (tty00) is the system manager's terminal and is the one used for booting and while in "single-user mode". The serial printer drivers (spr and spr2) are for normal serial printers connected to an MP-S2 serial interface card in I/O slot #7 or to the last two ports of an MP-S4 in I/O slot #4. The NEC Spinwriter drivers (nec) are for a Spinwriter interfaced via a SWTPc MP-QP parallel interface card in I/O slot #6. The parallel printer driver (ppr) is for a parallel interfaced printer connected to the PIA output found on the MP-ID card in the S/09 mainframe. The connector on that card is a DB-25 connector and should be wired as follows.

<u>Signal Description</u>	<u>DB-25 Pin Connection</u>
8 data lines	14-21
STROBE (complemented)	from 22
BUSY (complemented)	into 23

B) Standard UniFLEX Configurations

As mentioned before, there are either two or three versions of UniFLEX supplied on the distribution diskette. If your version uses the DMF-2 floppy disk controller, there will be two versions, one called 'uniflex' and the other 'uniflex1'. If it uses the DMF-3 disk controller, there will be three versions, each with two names in the directory (three files but six names). The first is 'uniflex' or 'uniflex8"', the second is 'uniflex1' or 'uniflex-CDS', and the third is 'uniflex2' or 'uniflex-5"W'. Each has a different configuration of the operating system. The difference comes in what disk device will be used as the root device (the root directory on this disk becomes the root directory of the system) when you boot the operating system. The file 'uniflex' boots up with the 8" floppy disk drive #0 as the root device, 'uniflex1' boots up with the CDS hard disk as the root, and 'uniflex2' boots up with the DMF-3 Mini Winchester hard disk as the root. These versions are shown in the following table.

	<u>uniflex-8"</u> or <u>uniflex</u>	<u>uniflex-CDS</u> or <u>uniflex1</u>	<u>uniflex-5"W</u> or <u>uniflex2</u>
root device:	fd0	hd0	w0
pipe device:	fd0	hd0	w0
swap device:	fd0	hd0	w0
console terminal:	tty00	tty00	tty00

Currently the user of UniFLEX can only operate under one of these three setups. At some future time, there will be a configurable version of UniFLEX which, along with the Configuration Guide, will allow a user to add his own device drivers into the system and to setup which devices are used for root, piping, swapping, etc.

Users who have purchased maintenance will automatically receive this version when available. If you have a special need at this time for a different configuration of UniFLEX, you should contact Technical Systems Consultants, Inc, about a custom version. It may also be possible to hire Technical Systems Consultants, Inc, to develop custom device drivers for certain hardware you wish to employ in your system.

The various configurations of UniFLEX supplied on the distribution disk are normal files. The bootstrap loader has been written to boot up the file named 'uniflex' which implies that you must at least initially boot the "floppy disk" configuration of UniFLEX. Once this has been done, several options are possible. If you have 8" floppies only, you will never need the other versions. If you have a hard disk, you will probably want to run with the hard disk as your root device (run the version called 'uniflex1' or 'uniflex2'). The exact procedure depends on whether or not you use a ROM with the capability of booting the hard disk directly. If you do have hard disk boot capability in your ROM, you will prepare your hard disk with either 'uniflex1' if the CDS or 'uniflex2' if the DMF-3 Mini Winchester copied to it but renamed to 'uniflex' and installed. You may then boot up UniFLEX from the hard disk by simply typing the appropriate command to your monitor. If your ROM does not have the hard disk boot, you will have to prepare a "hard disk boot floppy". This is a UniFLEX formatted disk with nothing but 'uniflex1' or 'uniflex2' copied to it but renamed to 'uniflex' and installed. Now, assuming your hard disk is properly prepared, you may boot the system by inserting the "hard disk boot floppy" in the appropriate drive and using the normal 8 inch floppy boot command in your monitor ROM.

APPENDIX A

TABLE of SWTPc UniFLEX™ VERSIONS and SUPPORTED HARDWARE
October 4, 1982

Part Number: For SWTPc: Hardware:	UOS-S1 S/09	UOS-S2 S+	UOS-S3 S/09 w/ DMF3	UOS-S4 S+ w/ DMF3
MP-09B	X		X	
MPU-1		X		X
DMF-2	X	X		
DMF-3			X	X
CDS	X	X	X	X
MP-S2	X	X	X	
MP-S4				X
NEC	X	X	X	X
Root/Swap Device for file named:				
uniflex or uniflex-8"	DMF2	DMF2	DMF3	DMF3
uniflex1 or uniflex-CDS	CDS	CDS	CDS	CDS
uniflex2 or uniflex-5"W	N/A	N/A	DMF3 5" Wini	DMF3 5" Wini