

WHETHER THE SS-50 BUS?

by Harold Mauch
President, Percom Data Company

This is issue number four of the Percom "Peripheral." This issue was planned for release a year ago. However, at that time and during the months that followed direction of the SS-50 bus market was unclear.

6809-based computers for the SS-50 bus have been introduced by several manufacturers but the market for SS-50 bus products has not expanded as fast as the market for Tandy, Apple and other personal computers.

TSC, Microware and others are developing good 6809 systems software but the more lucrative *applications* software such as Visicalc, Profile, Electric Pencil and Scipsit, which spur the sales of Tandy and Apple computers in the small business market, are virtually nonexistent.

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On the other hand, hardware variations of the SS-50 bus computer are much more easily implemented, and are more cost effective than variations of either the Tandy or the Apple computer.

Consequently, we feel the SS-50 bus computer is more adaptable to the needs of the experimenter-oriented computer hobbyist and to the systems designer configuring a control or specific application computing system.

With this conclusion in mind, Percom engineers have developed several SS-50 and SS-30 bus modules ranging from a six-shot motherboard to a color video display generator and a 48K dynamic memory card. Several of the new modules are described in this newsletter as well as suggested system configurations.

If you are a computer experimenter, you will enjoy Wayne Smith's article on "Plywood Computers".

The number of LFD-400 mini-disk system Users Group Diskettes has grown to ten and now includes the source of the 6809 disk drivers, plus software to build a complete semi-intelligent terminal using our SBC/9 and ELECTRIC WINDOW video display cards.

Incidentally, you should keep an eye on Percom TRS-80 advertising. Many of the products featured are easily connected to SS-50 bus computers -- for example, SPEAK-2-ME-2, the SPEAK 'N SPELL adapter, and the ELECTRIC CRAYON color graphics generator. (Secret: The ELECTRIC CRAYON uses a 6802 to perform its magic!)

PLYWOOD PRODUCTS

by Wayne Smith

A few weeks back, I was complaining to our Marketing Manager about how the small computer industry as a whole had abandoned the experimenter and that there just wasn't a cheap way to get into micro computing anymore. He indignantly informed me, number one, that, "WE do not use the word 'cheap'". WE use the word "inexpensive," and, number two, if I thought things were bad now, I should wait until January 1st when the FCC rules on home computer EMI take effect. Well,

January 1st has come and gone. The prices haven't made any dramatic swing up but they haven't come down, either. (So much for forecasts by our Marketing Manager.)

The objective of this article is to discuss some of the techniques I used to bring up my "inexpensive" personal system and some of the "inexpensive" systems developed for testing in the lab at Percom.

The first and most important problem I was faced with was how to start.

After hours (with calculator in hand) brainstorming, think-tanking, etc., and after throwing out the idea of making an aluminum enclosure out of old Dr. Pepper

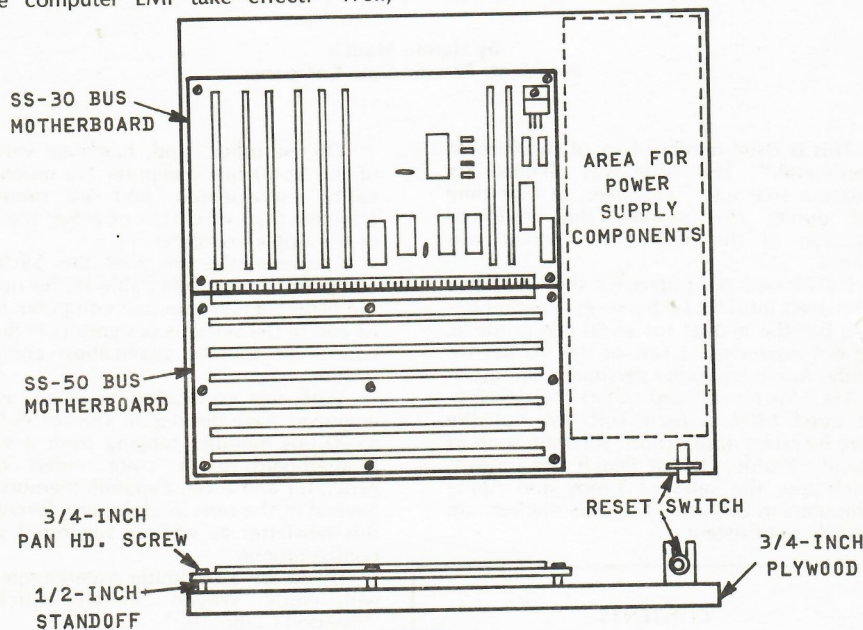


FIGURE A

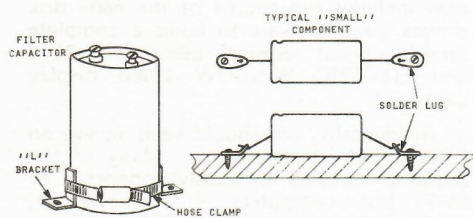
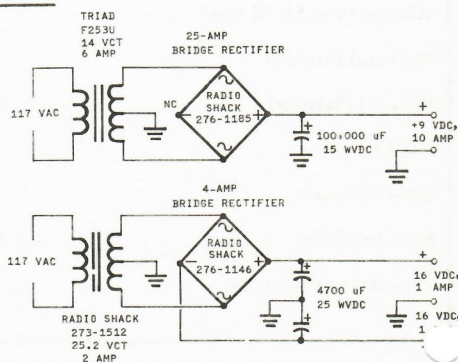


FIGURE B



...it dawned on me....plywood! Curiously, 3/4" x 16-1/8" x 15-1/4" was the ideal size. I felt very fortunate when the scrap I found in my garage turned out to have precisely those dimensions, so I didn't have to cut it! (The ideal size will vary from garage to garage.)

Figures A and B give a suggested layout, and installation methods for components. Hose clamps and "L" brackets are ideal for mounting large caps. Solder lugs screwed into the plywood base provide mechanically sound tie points, and, lest "WE" forget, inexpensive six-slot SS-50 motherboards and SS-30 motherboards are available from Percom. These units conveniently plug right into each other so that an SS-30 section can be added later -- or left off altogether -- depending upon system needs. Both SS-50 and SS-30 proto boards are available if you take a notion to learn the true meaning of "Built from Scratch".

A good power supply spec would be 10 A at -16 Vdc, unregulated. A schematic of a supply that meets these specifications is shown on page 2. Remember, you need 8,000 to 10,000 microfarads/amp on your supply to get no more than 0.5 ripple (all calculations ± 2 dB). Careful! If you use a surplus supply, check it out thoroughly or your "inexpensive" computer will turn into an expensive smoke generator.

Many variations of the "Plywood Computer" can be invented. My favorite is one where I do away with the motherboard altogether and plug two boards into each other. See Figure C. This can be a very powerful configuration! An SBC/9 (6802 version) and an ELECTRIC WINDOW instantly form a data terminal (with DB-25 interconnect). A parallel keyboard can be interfaced to the SBC/9 superport and a video monitor to the ELECTRIC WINDOW.

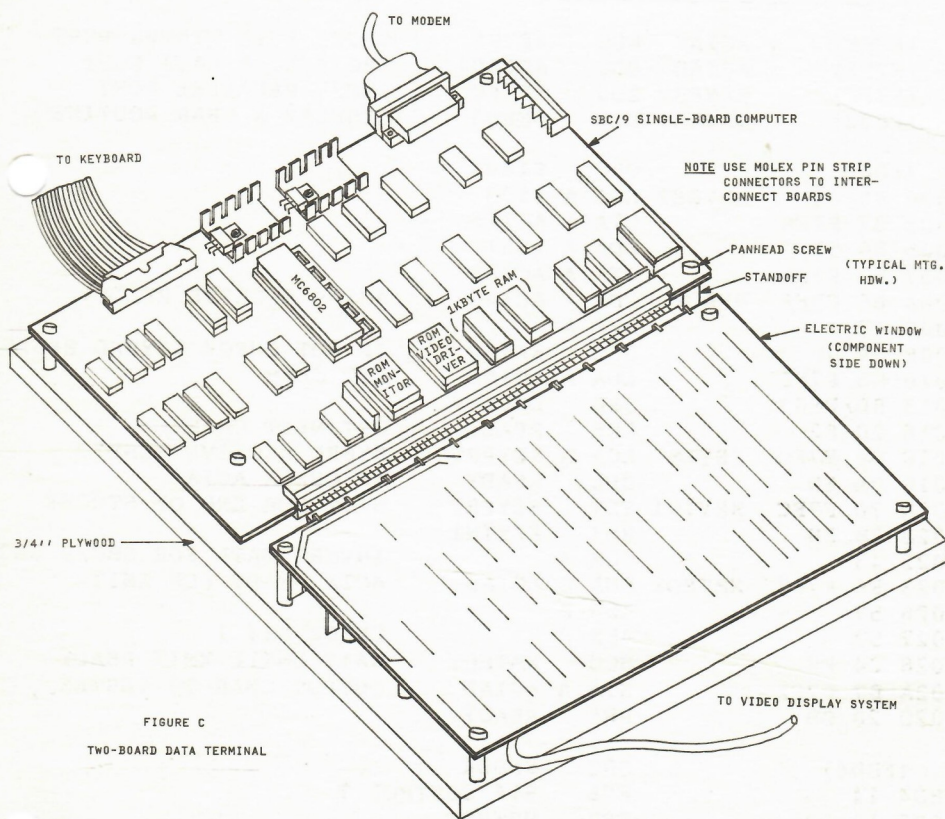


FIGURE C
TWO-BOARD DATA TERMINAL

Special purpose projects like this also limit the need for large power supplies. (SBC/9 + ELECTRIC WINDOW = 3 A at +10 V, 1 A at +15 V, 1 A at -15 V). This also could be done with our COLORAMA card to form an intelligent color graphics terminal.

Another system idea would be to mate the SBC/9 with the Percom 48K dynamic RAM card, forming a very compact system. Any boards used in this configuration could easily be reclaimed for other projects at any time.

I hate to say it, but the FCC will need equal time at this point. Unshielded micro's do have a tendency to radiate RFI. If you build a computer that makes your neighbor's TV go bananas, you are responsible for correcting the situation. Volumes have been written on the subject so if you run into trouble, consult your local library or Radio Amateur's Handbook.

BEYOND PLYWOOD

by Phil Sanders

The seed for Wayne Smith's cheap plywood project discussed elsewhere in this issue of the Peripheral was born of necessity as much as blue-skying. One day we came up short a data terminal, and the "instant" plywood terminal he mentions became an inexpensive semi-intelligent terminal that took the place of an ADM-3.

The inexpensive plywood terminal consists of an SBC/9 configured for a 6802, an ELECTRIC WINDOW, SS-50 bus connectors and an ELECTRIC WINDOW driver EPROM that plugs into the SBC/9 \$F800 ROM socket.

The power of this system is that it can be configured, modified, or added to by changing the firmware. In other words, you can construct a terminal to satisfy your needs through software.

(F7FE)	ACIAS	EQU	\$F7FE	SBC/9 ACIA STATUS PORT
(F7FF)	ACIAD	EQU	ACIAS+1	SBC/9 ACIA DATA PORT
(F7FC)	KEYPRT	EQU	\$F7FC	SBC/9 PARALLEL PORT
(F803)	DSPLAY	EQU	\$F803	DISPLAY A CHAR ROUTINE
(1000)		ORG	\$1000	
1000	86 03	MSTRST	LDA A #\$03	
1002	B7 F7FE		STA A ACIAS	
1005	86 51		LDA A #\$51	
1007	B7 F7FE		STA A ACIAS	
100A	B6 F7FE	READY	LDA A ACIAS	ACIAS RECEIVE READY?
100D	47		ASR A	
100E	24 08		BCC KEYIN	IF NOT CHECK KEYBRD READY
1010	B6 F7FF		LDA A ACIAD	GET CHAR
1013	BD F803		JSR DSPLAY	
1016	20 F2		BRA READY	GET NEXT CHAR
1018	B6 F7FC	KEYIN	LDA A KEYPRT	KEYBRD RECEIVE READY?
101B	2A ED		BPL READY	IF CHECK ACIA
101D	7D F7FC	KEYIN1	TST KEYPRT	WAIT FOR END OF STROBE
1020	2B FB		BMI KEYIN1	
1022	43		COM A	INVERT DATA FOR SBC/9 8835
1023	F6 F7FE	XMTRDY	LDA B ACIAS	ACIA READY FOR XMIT
1026	57		ASR B	
1027	57		ASR B	CHECK BIT 1
1028	24 F9		BCC XMTRDY	WAIT UNTIL XMIT READY
102A	B7 F7FF		STA A ACIAD	OUTPUT CHAR TO TESTEE
102D	20 DB		BRA READY	
(FBD4)		ORG	\$FBD4	
FBD4	14		FCB \$14 CONTROL T	
FBD5	10 00		FDB MSTRST	
	00	ERROR(S) DETECTED		

For example, our drive allows us to change the video format from 24 x 80 interlace to 24 x 64 interlace or 16 x 64 non-interlace with a couple of key strokes. This video driver and others are available on LFD-400 Users Group Diskette UGD-6. On page four is the routine that configures the inexpensive plywood terminal as stand-alone, semi-intelligent data terminal.

TERMINAL COMMANDS

Configures the system so it will communicate with outside systems. Characters input by the keyboard through the parallel port are routed to an outside system by the ACIA. Consequently, the keyboard talks (gives commands, data, etc.) to an outside system. Input from the ACIA is routed to the SBC/02 (SBC/9 with 6802) input character routine, letting the outside system also talk to SBC/02. This is the basis for configuring the SBC/02 and ELECTRIC WINDOW as a terminal.

INDEX...TRY IT. YOU'LL LIKE IT!

By Phil Sanders

Despite the recent hoopla and rash of 6809 advertising, you don't have to discard your 6800 processor and 6800 programs to have a powerful and sophisticated disk operating system. Instead, upgrade to INDEX (INTerrupt Driven EXecutive).

INDEX is the most powerful disk operating and file manager system available for the 6800 microprocessor. INDEX was modeled after the disk operating systems of a DEC computer and has many UNIX features.

INDEX, being interrupt driven, is a real-time operating system in which your processor will not have to waste processing time sitting in a software loop; data flow and program execution will also be increased.

INDEX is file and I/O device independent and allows limited pipe-lining. Data transfer I/O is the same regardless of the device type; INDEX doesn't know the difference between a disk file and a printer, and it doesn't matter. Thus, devices may be added without modifying the operating system.

All file control is handled internally by INDEX. Consequently, INDEX will automatically close all open files and thereby prevent disk crashes.

Type-ahead is permitted by buffered I/O to external devices. As you type in the current line, the previous line is simultaneously being processed.

Also there is a multi-level directory and many other 'big' computer features.

INDEX is supported by editors, assemblers, compilers, and Percom Super BASIC. Plus, Percom continues its INDEX upgrade policy in which LFD-400 users can upgrade their MPX programs to INDEX for a nominal fee. And a special added attraction: The INDEX Advance Programmers Guide (Use INDEX to its maximum power while learning advanced programming techniques) has been reduced to \$29.95.

Don't throw away your present processor and investment for a new and expensive disk operating system when much of the same power is available with INDEX. And much, much cheaper. Quit the rat race. Try INDEX, you'll like it.

6809 SOFTWARE

By Tim McKee

The MPX/9 DOS and PSYMON Monitor

We have developed a disk operating system for use with our 6809 PSYMON operating system that is quite different from its 6800 predecessor. It is called MPX/9, and is available off-the-shelf.

MPX/9 consists of two pieces, a ROM to be placed in the LFD400 card and a diskette containing the actual disk operating system. The ROM contains the Read-Sector and Write-Sector routines, and a routine that will read the contents of track 0 sector 0 into memory and execute it. Sector 0 on track 0 contains a "boot" that will control the loading of the actual disk operating system. The book that we supply will start searching for the highest 4K block of memory, below the address of the disk controller card, and proceed to load MPX/9 into that memory. The boot will then transfer control to MPX/9.

This structure presents a dilemma to assembly language programmers who are used to performing a "JSR" to a routine in the DOS: the programmer wouldn't know from one system to the next where the highest 4K of memory would be located! We structured this software so that the user never needs to know where MPX/9 is

located. All operating system software calls are made by executing an "SW13" instruction followed by a one-byte number signifying what operation you desire.

MPX/9 links directly to PSYMON. In fact, it *requires* PSYMON to operate. PSYMON is a 1Kbyte OS for the 6809. While it provides the usual monitor commands and breakpoint management PSYMON's true power is in its structure and extensibility. PSYMON may be tailored for nearly any configuration. This is done using a unique "look-ahead" feature and a Device Control Block (DCB). The "look-ahead" feature allows a user-written routine to alter pointers used by PSYMON. The DCB allows PSYMON to be nearly I/O device independent by leaving details of the I/O to the specific I/O device driver. The Device Control Block (DCB) structure of PSYMON is expanded by commands that will search the DCB list for a specific DCB, delete a DCB from the linked list of DCBs, and add a DCB to the linked list of DCBs. Some very good examples of this are found on UGD-9, an LFD-400 User Group Diskette, in the source file for the LIST utility.

MPX/9 allows the user to open and close files by filename, to perform sector-by-sector Read/Write to the disk, and to perform character-stream I/O to the disk.

The following is a complete list of MPX/9 system calls

- 0) Return to PSYMON monitor.
- 1) Execute I/O request.
- 2) Output character to console.
- 3) Input character from console.
- 4) Print string on console.
- 5) Get HEX number from console.
- 6) Print 4-digit number in hex.
- 7) Print 2-digit number in hex.
- 8) Return to MPX/9.
- 9) Get a line of input from terminal.
- 10) Skip spaces in line of text.
- 11) Go to next word in line of text.
- 12) Process text line as MPX/9 command.
- 13) Report error to console.
- 14) Locate a file.
- 15) Locate a free space on disk for file.
- 16) Read a disk directory.
- 18) Initialize a File Control Block.
- 19) Open a file.
- 20) Close a file.
- 21) Read a character from a file.
- 22) Write a character to a file.
- 23) Read a sector from a file.
- 24) Write a sector to a file.
- 25) Load a memory segment.

- 26) Save a memory segment.
- 27) Compare two ASCII strings.
- 28) Move a block of memory.
- 29) Get a decimal number from text string.
- 30) Get a hex number from text string.
- 31) Print decimal number and space.
- 32) Delete a file.
- 33) Locate a DCB.
- 34) Add a DCB.
- 35) Delete a DCB.

6809 Super BASIC

Super BASIC is available to run on the 6809 with MPX/9. It is faster and has several additions (see patches elsewhere in this issue of the Peripheral). And -- good news -- the price of Super BASIC is now only \$29.95.

FLEX/9 Overlays

We also have overlays that will convert FLEX 9.0 software to operate on a Percom LFD-400 mini-disk system. This software, called FLEXTRAN/9, requires two drives, and 8K of memory at \$C000. This mapping necessitates relocating your LFD-400 controller to the \$E000 range. Complete instructions are supplied with the software (FLEX 9.0 must be purchased from TSC or a TSC distributor.)

NEW PRODUCTS

We've introduced a number of new SS-50 bus products since the last issue of the Peripheral. Thumbnail descriptions of the principal ones are set forth below. These briefs were prepared by Dale French of our technical staff.

M24SS Static RAM Card: A 24-Kbyte static RAM board organized into three independent 8-Kbyte blocks. Works with either the standard SS-50 or the 1-Mbyte extended addressing bus. Comes assembled, burned-in and tested. Users manual includes source listing of diagnostic memory test. Also available in 8- and 16-Kbyte configurations.

M48DSS Dynamic RAM Card: A low power 48-Kbyte dynamic RAM board organized into three independent 16-Kbyte blocks. Works with either the standard SS-50 bus or the 1-Mbyte extended addressing

mes assembled, burned-in and tested. Users manual includes source listing of diagnostic memory test. Also available in 16- and 32-Kbyte versions.

ColoRAMa-50: A memory-mapped color VDC board. Generates alphanumerics, semi-graphic displays. Full graphic resolutions range from 64 x 64 pixels to 256 x 192 pixels. Displays in two, four or eight colors, depending on the display resolution. Two- and four-color displays may be complemented. Board is designed to accommodate a low cost Radio Shack modulator for TV set display. Comes with one Kbyte of display RAM which provides for alphanumeric, semigraphics and two low-density full graphic display formats. Also provides for 2-Kbyte EPROM. Cassette I/O provides for low-cost file storage. Users manual includes source listing of display OS. works with 1-Mbyte extended addressing bus. The ColoRAMa-50 occupies an 8-Kbyte block of memory in the upper half of a 64-Kbyte address space. Board accommodates additional RAM for higher density display modes.

The COLOR CONNECTION: A cable/circuit card assembly which is used to adapt the 6809-based TRS-80 Color Computer to the SS-50 bus. The COLOR CONNECTION allows access to LFD-400 mini-disk storage, RAM expansion, interfacing (via the ELECTRIC WINDOW, e.g.) to a word-processing quality BW display system; etc.

SS-50 Bus Motherboard: A seven-slot system bus card that can also be used as an extender card for servicing function cards.

SS-50 Bus Motherboard Kit: Accommodates up to eight 30-pin I/O cards. Supplied complete with PC board connectors and components required for application as an I/O extension motherboard for the SS-50 bus.

Since the last Peripheral was issued, many new 680X programs have been released. Two new 6809 releases, mentioned elsewhere in this issue of the Peripheral, are MPX/9, a 6809 DOS for our LFD disk systems, and a 6809 version of Percom Super BASIC.

To place an order or request product literature, call our toll-free order number, 1-800-527-1592. For additional technical information call (214) 272-3421.

LFD-400 Users Group

To permit all LFD-400 users an information exchange forum, we have formed an LFD-400 Users Group. This newsletter will be used to inform users of contributed programs and suggestions. However, software will be distributed on diskette for a nominal charge to cover cost of reproduction and distribution.

NOTE: User Group Diskettes #1, #2 and #3 were described in the last issue of the Peripheral.

LFD-400 UGD #4

This diskette is dedicated to Motorola's Micro Chroma 68 and its TVBUG monitor. Included are over a dozen video displays and several source listings from the Percom ELECTRIC CRAYON to use as driver examples. System Requirements:
Micro Chroma 68 with TVBUG
LFD-400EX (at least one drive)
7K of RAM at \$0000

LFD-400 UGD #5

HEXLD1: Hex loader with offset. Source and object files.

BASEDT: Links Peter Stark's BASIC Editor from Jan. '79 Kilobaud to MPX. Source and object files. Submitted by Doug Beck.

OTHELO: A game in Percom Super BASIC. Submitted by Doug Beck.

TTT\$: Tick-Tac-Toe in Strubal. Submitted by Doug Beck.

ALIGN: Program for drive alignment. Source and object files. Submitted by W. A. Arrera.

HEXLD2: Hex loader with offset. Source and object files. Submitted by W. A. Arrera.

LIST: Print program with universal print driver. Source and object files. Submitted by K. J. Kroeker.

HEXLD3: Hex loader with offset. Source and object files. Submitted by Val Walker.

PRMLDR: Hex loader with offset for Index. Source, object, and Help files. Submitted by Joe Sasser.

CONCAT: Program to copy and concatenate files. Source and object files. Submitted by Rex Klopfenstein, Jr.
DINDEX: Master file directory in alphabetical order. Use with Percom Super BASIC. Source and object files. Submitted by Peter Stark.
GRAPHIC: Controller for the SWTPC GT 6144 Graphics Terminal. Object and Help files. Submitted by Donald Taylor.

LFD-400 UGD #6

New diskette January 1981

VIDEO+: Deluxe 6800 video driver for 64 x 16 memory mapped video board; includes changes to MICROBUG monitor to allow it to be used with VIDEO+. Submitted by Gary Calvert.

VIDEO9: 6809 video driver for a 64 x 16 memory mapped video board and PSYMON operating system. This listing does not require a 6809 assembler as Gary used an interesting technique to produce 6809 op-codes on a 6800 assembler. Submitted by Gary Calvert.

SWTPAT: Patch and other tips to modify SWTBUG monitor for operation with WINDEX. Submitted by Tim McKee.

VIDRVR: Deluxe video driver for the ELECTRIC WINDOW. Submitted by Phil Sanders.

MISCEL: Two commands that may be added to VIDRVR; one permits the ELECTRIC WINDOW and SBC/9 configured for 6802 to communicate with another system, the other configures VIDRVR for a 'typewriter' mode.

LFD-400 UGD #7

This diskette contains the source files for the MPX/9 disk operating system and the 6809 disk driver ROM. These source files are on a 6800-compatible disk and may be edited, assembled, etc. with existing 6800 software, or they may be converted to 6809 format with your system REMAP utility. (See UGD #8).

LFD-400 UGD #8

This diskette contains the source files for the MPX/9 disk boot, the REMAP utility and the COPY utility. These source files are in 6800 format, same as UGD #7.

LFD-400 UGD #9

This diskette contains the source files for UGD #10 in 6800 format same as UGD #7.

LFD-400 UGD #10

MPX/9 utility system diskette. Contains the following utilities:

- Serial Line Printer driver
- Vector output to any device
- Print formatted directory
- List a file
- Load a hex (S1-S9) file with offset
- Execute commands from a text file
- Disk sector editor
- Certify a diskette
- Create a text file
- Verify the readability of a diskette
- Memory test

Ed. Note

A supplement to this issue of the Peripheral is available from Percom Data Company. The supplement includes more special information -- for example, notes on product improvement and maintenance -- and a 'short-form' product price list. This supplement, which is automatically mailed to subscribers of the Peripheral, may be obtained from Percom by calling our toll-free order number, 1-800-527-1592. From within Texas, call (214) 272-3421.

TRADEMARKS APPEARING IN THIS ISSUE OF THE PERIPHERAL:

Percom Data Company, Inc.: ColoRAMa-50, the COLOR CONNECTION, ELECTRIC CRAYON, ELECTRIC WINDOW, EXDOS, INDEX, LFD-400, LFD-800, ModuLEX, MPX/9, PSYMON and SBC/0.

Blue Hat Software Company: DIXIE

Motorola Corp.: EXBUG, EXORciser, MICROBUG, MICRO CHROMA, MIKBUG and MINIBUG.

Star-Kits Company: HUMBUG

Tandy Radio Shack Corp.: TRS-80

Technical Systems Consultants, Inc.: FI