RAM SPOOLER PROGRAM FOR THE TRS-80 MODEL I AND MODEL III

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This program is a print formatting system for both parallel and serial printers. It allows you to direct the line printer output to either the parallel port, the serial port, or the video screen under immediate software control. It will allow you to specify the number of lines per page, characters per line, and whether you want the printing continuous or divided into pages. It will allow you to print the contents of the video screen. It will also set up a reserved memory area from which the printing will be done so that the print command will return control to the operator before all printing is finished. This allows programs to continue while printing is being done, saving a great deal of time with slow printers. It works with all BASIC print commands and any other programs which use the standard keyboard and printer device control blocks. It contains its own driver for the standard Radio Shack RS-232 port and checks Data-Set-Ready for handshaking.

The program is entirely machine code and resides in upper memory. A MEMORY SIZE will have to be specified to protect it. The table below shows the memory limit for the various versions. There are six copies of the program on the enclosed cassette. The first two are the 16K version, the second two are the 32K version, and the last two are the 48K version. There are two copies of each version in the unlikely event that one of them is bad. The program is loaded from BASIC with the SYSTEM command. After it has loaded DO NOT type "/" and <ENTER> to execute the program. If you have a Model I, just hit <BREAK>. If you have a Model III, hit <ENTER> and then <BREAK>. The program does not need to "execute". Just loading it is enough to patch it into your system. If you have disk drives you may return to DOS READY and use the DUMP command to store the specified memory area on disk. Alternately, Model I users may use TAPEDISK or LMOFFSET to store the program on disk. Model III users may use the TAPE utility. Other operating systems may have other tape loading utilities as well. In any event, the following addresses will be necessary:

VERSION	MEMORY SIZE	START	END	ENTRY
16K	27647	6C00=27648	6FFF=28671	6C15=27669
32K	44031	AC00=44032	AFFF=45055	AC15=44063
48K	60415	EC00=60416	EFFF=61439	EC15=60437

Format commands are entered by simultaneously depressing one of the command keys and the left-arrow key. Some of the format commands may be reversed by holding down the command key, the left-arrow key, AND the shift key. The spooler is continually watching the keyboard and knows when you hold down one of these key combinations. It is not necessary to hit <ENTER> after giving a command and it does not matter if a character appears or does not appear on the screen. If a character is left on the screen just backspace over it.

With the spooler active, when you type LLIST or LPRINT the cursor will disappear for a short while and then return and say READY. The printer will keep running until all the data has been printed. This is not true, however, if you are printing more data than the 4K buffer will hold. In this case the spooler will need to maintain control of the keyboard until the entire buffer has been printed. Then, if there is less than 4K of data left to be printed, control will return to the operator and the printer will continue until the buffer is empty. Instructions are given at the end of this documentation to increase the 4K buffer size.

This spooler has the ability of intelligent line termination. What this means is that after a pre-defined number of characters has been printed on each line the program will start looking for a logical place to break the line. The logical terminators looked for are spaces, exclamation points, right parenthesis, commas, periods, colons, and semi-colons. If it doesn't find one of these in a specified number of characters a line feed will be forced anyway to prevent printing off the paper.

A short description of each of the control functions will now be given. Remember that each control character must be depressed simultaneously with the left-arrow key to have its effect.

"1" sets the spooler to direct its output to the parallel port. This is the default mode.

"0" (zero) sets the spooler to direct its output to the standard serial port.

"V" sets the spooler to direct its output to the video screen. This is useful for debugging programs without having to waste paper on printer functions. The screen may become very cluttered, however, due to the fact that it is being driven from two different sources. This mode will also verify that the spooler is in and working properly.

"C" clears the characters/line and lines/page counters. It is a good idea to enter this command before every listing to be sure you start printing at the top of a page.

"U" will initialize the RS-232 port. THIS PORT MUST BE INITIALIZED BEFORE USING SERIAL PRINTERS.

"B" allows you to enter a baud rate for the serial port. After pressing "left-arrow B" a question mark will appear in the lower right-hand corner of the screen. You must then enter a number between 1 and 7 to select one of the following baud rates. 300 baud is the default rate.

1=110 2=150 3=300 4=600 5=1200 6=2400 7=4800

"F" is the "form feed enable" command. You must enter this command if you want to use form feed commands (ASCII 11 or 12), skip perforations on continuous paper, or print on single sheets. The program comes configured to print 56 lines of text on a 66 line page. This means there will be 10 blank lines between pages. If you want to change these values a table at the end of these instructions will tell you how to do that. To turn off the form feed function hold down the "F" key, the left-arrow key, and the shift key simultaneously. The default mode is off.

"L" causes each carriage return to be followed by a line feed (ASCII 10) which some printers require. To turn off this function hold down the "L" key, the left-arrow key, and the shift key. The default mode is off.

"P" is the pause command. If you are using single sheets of paper and want the printer to wait for you to change them use the "P" command. After the specified amount of text and empty lines have been printed the computer will seem to lock up and a left-arrow and "P" will appear in the lower right-hand corner of the screen. This is your reminder to put a new sheet of paper in the printer and hit "left-arrow P" again to resume printing. The form feed function must be enabled for this to work. To turn off this function, hold down the "P" key, the left-arrow key, and the shift key. The default mode is off.

"I" is the indent command. In program listings it is convenient to indent after each forced line feed. This makes the final listing easier to read. For other types of LPRINTing, however, this is not desirable. To turn off the indent mode, hold down the "I" key, the left-arrow key, and the shift key. The default mode is off.

"W" increases the number of characters allowed per line before a forced line feed occurs for 15" wide paper (132 characters).

"N" resets the number of characters allowed per line for narrow (8 1/2") paper.

"X" stops characters from being sent to the printer. This is like an immediate pause for the printer. If your printer has its own memory, however, it will continue printing until it is empty.

"G" resumes printing after CONTROL-X (above).

"S" will print the contents of the video screen. All 16 lines of video data will be printed with graphics characters being replaced by periods.

The left and right arrows depressed simultaneously will clear all characters currently in the buffer and stop printing. It may be viewed as an "abort" function to terminate printing.

That is all of the commands in the spooler program. There are, however, several values in the program which may be changed should you have a need to. These numbers may be examined from Basic with the PEEK command and they may be changed with the POKE command. The addresses for the three versions of the program and their respective functions are as follows:

16K	32K	48K	FUNCTION
27648	-21504	-5120	Lines of printing per page (default is 56).
27649	-21503	-5119	Total number of lines per page (default is 66).
27650	-21502	-5118	Number of characters per line before automatic line feed may occur.
27651	-21501	-5117	Number of characters per line before mandatory line feed.
27653	-21499	-5115	Most significant byte of the end address of the print buffer.

To give some specific examples, let's say you want to use a form that is only 8 inches long instead of 11. At 6 lines per inch, you would have a total number of 6 X 8 or 48 lines per page. This non-standard value would need to be POKED into the appropriate location to get the proper form feed amount. You would also want to change the number of lines printed per page to be fewer than this. Let's say you want to have a top and bottom margin of 3 lines for a total of 6. The number of lines of printing per page would then be 48 - 6 or 42. This non-standard number would also need to be POKED in. In a 32K machine you would execute the following commands in Basic:

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10 POKE -21503,48        :REM: NUMBER OF LINES PER PAGE
20 POKE -21504,42        :REM: NUMBER OF LINES OF PRINTING PER PAGE
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The last address in the table above deserves special explanation. It indicates the last "page" of memory used by the spooler program. Let's say you have 48K of RAM. Let's also say you have a program that uses a special machine code routine at hex address FE00. But the spooler will normally use all available memory (FFFF in this case) and would "crash" your machine code sub-routine. To protect this routine you will need to define the last "page" or most significant byte of memory used by spooler to be less than FE00. That means hex value FD. This would be converted to decimal, which is 253. You would then POKE 253 into -5115 (POKE -5115,253).

This may sound confusing, but most people will never need to use it. This "last address" location allows one other useful trick, however. If you have 48K you can get a 20K spooler buffer instead of the standard 4K. To do this set MEMORY SIZE for the 32K spooler program and load it. Then define the last byte used as the top of 48K (POKE -21499,255). The last 16K of memory will now be part of your spooler buffer. The same trick can be accomplished if you have 32K and run the 16K version of spooler. In this case you would define the last byte used by the 16K spooler program as the top of 32K (POKE 27653,191). It follows that if you have 48K you can run the 16K version of spooler and get a 36K buffer if that should be useful.

There is probably no component of the TRS-80 system that varies as much as printers do and it is extremely difficult to develop one program that will work for all of them. If you have problems with this program on your printer, get in touch with us and we can probably determine what the problem is and try to find a solution. Finally, if you have any compliments or criticisms of this program or this documentation we would be interested in hearing from you. It is in this way that we will be better able to serve you and future customers. Address all correspondence to:

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