UNIVAC
DATA PROCESSING DIVISION

1050
CARD SYSTEM

INPUT/OUTPUT ROUTINES

PRINTER ROUTINES

REFERENCE MANUAL

UP-3915-2.03

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1. INTRODUCTION

1.1. SCOPE

This document provides the programmer with the information necessary to make use of the 4K card system and expanded card system printer routines. It describes the area requirements, specializations, and the entrances to the routines. Section 2.4 is devoted to describing upward and downward compatibility between the 4K and expanded system routines. Displays for printer error conditions, and the recovery procedures are described in the last section.

1.2. GENERAL DESCRIPTION

The printer routines are distributed in source code with a comment card containing the name in columns 19 to 24. These routines control the operation of the printer. Five entrances are available with the printer routines: initialize, execute, advance paper without printing, remote area print, and close. Either the advance paper without printing, or remote area print sections of the 4K print routine may be excluded to conserve space.

Each routine addresses an output area, the name of which is preassigned for 4K routines, and programmer assigned for the expanded printer routines. The reserve areas, aligned consecutively in storage, are addressed through an index register (see Table 1), which contains the relative addresses of the current card image area. This address is relative to the beginning of the output area.

Besides the regular output area,"remote areas" may be printed through the remote area print entrance. A remote area is a print area not included within the regular print area. Remote areas can be used to print such things as heading lines, and page number making unnecessary the transfer of constants to the regular print area.

The following table summarizes the general characteristics of each routine.

ROUTINE NAME	DESCRIPTION	MIN. SIZE SYS.	ENTRANCES			IR	ROUTINE SIZE	OUTPUT AREA		TOTAL SIZE
			INITIALIZE	EXECUTE	CLOSE			NAME	SIZE	
PR8	80 col. system, 128 char. line	4K	XIP	XXP	XCP	3	160*	XAP	256	416*
PR9	90 col. system, 128 char. line	4K	XIP	XXP	XCP	3	160*	XAP	256	416*
PRX8	80 col. system, 132 char. line, (for buffered printer only)	4K	XIP	XXP	XCP	3	160*	XAP	264	424*
PRX9	90 col. system, 132 char. line, (for buffered printer only)	4K	XIP	XXP	XCP	3	160*	XAP	264	424*
PRL8	80 col. system, 128 char. line, without overlapped processing	4K	XIP	XXP	XCP	3	115*	XAP	128	243*
PRL9	90 col. system, 128 char. line, without overlapped processing	4K	XIP	XXP	XCP	3	115*	XAP	128	243*
PRT8	80 col. system, 128 char. line, channel 0 print	8K	XINPR	XCTPR	XCLPR	†	606**	†	256 ‡	862 ‡
PRT9	90 col. system, 128 char. line, channel 0 print	8K	XINPR	XCTPR	XCLPR	†	606**	†	256 ‡	862 ‡
PTX8	80 col. system, 132 char. line, channel 0 print	8K	XINPR	XCTPR	XCLPR	†	626**	†	264 ‡	890 ‡
PTX9	90 col. system, 132 char. line, channel 0 print	8K	XINPR	XCTPR	XCLPR	†	626**	†	264 ‡	890 ‡

* *Does not include the space required by the remote area print (30 characters), and the advance paper without printing (35 characters) sections of the print routine.*

† *Programmer assigned in the specialization procedure.*

‡ *Minimum.*

** *Plus 1 for each additional print area.*

Table 1. Printer Routine Characteristics

2. PROGRAMMING PROCEDURES

2.1. PROGRAM SPECIALIZATION

Specialization provides the source code printer routine with certain labels and constants, and designates optional modes of operation.

No specialization is required for the 4K printer routines. The label of the output area (XAP), number of reserve areas, and the index register containing the relative area address are already assigned (see Table 1).

Specialization for the expanded system printer routines is accomplished through the use of the EQU directive as follows:

CE / INS 5 6	LABEL 7 — 11	OPERATION 13 — 18	OPERANDS 19 — 30 — 40
	label	E Q U	definition

The label field contains the predefined label, and the operands field contains the required definition, as listed below.

LABEL	DEFINITION
X1P$	Label of AREA associated with the routine.
X2P$	Number of reserve areas, 2 to 21.
X3P$	Memory address of index register to contain the relative area address.
X4P$	64 for half line printing, 0 for full line printing.
X5P$	0 for half line printing, X2P$ for full line printing.

2.2. OUTPUT AREA

When defining the regular output area, or a remote output area for the unbuffered printer, the first character position must be a multiple of 64. This restriction does not apply with the buffered printer.

To ensure the proper location of the output area, use the ORIGIN statement as in the following example:

CE / INS 5 6	LABEL 7–11	OPERATION 13–18	OPERANDS 19–40
		ORIG	$64
	XAP	AREA	256

2.3. ENTRANCES

2.3.1. Initialize

The initialize section must be entered before an attempt to print a line. This is accomplished by a Jump Return (JR) to XIP with a 4K printer routine, or XINPR with an expanded system routine.

Initialization clears all reserve areas to spaces, and sets the channel interrupt entry, and all counters and indicators to their initial conditions. Also the base address of the first print area is placed in index register 3 for the 4K print routine, or the index register specified by the programmer during specialization of the expanded system routine.

2.3.2. Execute

Before the execute section can be entered, the number of lines to be advanced before each line is printed must be set. This is done by storing a single character to the location XVP with a 4K routine, or XADVC with an expanded system routine. For example, with a 4K print routine, set the advance to three lines as follows:

CE / INS 5 6	LABEL 7–11	OPERATION 13–18	OPERANDS 19–40
		SC	XVP,3

The execute section is entered when the worker program has finished editing the data and is ready to print another line. This is accomplished by performing a Jump Return (JR) to XXP with a 4K printer routine, or to XCTPR with an expanded system routine. A print instruction will then be issued if the previous one has been completed. The base address of the next area to be printed is maintained in index register 3 for the 4K routine, or in the programmer assigned index register for an expanded system routine. Once an image area becomes available, control is transferred back to the worker program.

2.3.3. Remote Area Print

The remote area print section of the printer routine is entered when the worker program wants a remote area printed. A "remote area" is a print area that is not included in the regular print output area. The worker program can place as many remote areas in storage, as the storage capacity permits. Remote areas can be used to print such things as heading lines, page numbers, and so on, makine unnecessary transfer of constants to the regular print area. The location of a remote area is subject to the same limitation as the regular output area – the first character position must be a multiple of 64 if an unbuffered printer is being used. The size of a remote area must be the same as that of a regular print reserve area; that is, 128 characters, 132 characters, or 64 characters in the half line mode.

Before entering the remote area print section of the 4K printer routine, the worker program must store the base address of the remote area in three characters at XRP, and the number of lines to be advanced in one character at XVP.

Before entering remote area print for the expanded system routine, the worker program must store the base address of the remote area in three characters at XRMAR, and the number of lines to be advanced in XADVC.

Once the base address and lines of advance are set, the remote area can be printed by performing a Jump Return to XQP for a 4K routine, or to XCTQL for an expanded system routine. The close section of the print routine is entered automatically before the print instruction is executed.

If the 4K routine remote area print function (XQP) is not desired it may be removed from the source deck to save 30 locations. The remote area print subroutine constitutes card numbers in the range 00300 to 00399.

2.3.4. Advance Paper

This section is entered when the worker program wants the paper advanced a specified number of lines without printing. The number is specified by a Store Character (SC) to the location XVP for a 4K routine, or to XADVC for an expanded system routine.

To advance paper without printing, perform a Jump Return to XUP with a 4K routine, or XCTAD with an expanded system routine. The close section is entered automatically before the advance is executed.

If the 4K routine advance paper function (XUP) is not desired, it may be removed from the source deck to save 35 locations. The remote area print subroutine constitutes card numbers in the range 00400 to 00499.

2.3.5. Close

The close section must be entered before ending the program in order to print all remaining print images. It is also entered automatically each time the remote area print or advance paper sections are entered.

To close, perform a Jump Return to XCP for a 4K print routine, or XCLPR for an expanded card system routine.

2.4. COMPATIBILITY

2.4.1. Upward Compatibility

The 4K input/output routines are designed to be used in a manner analogous to the corresponding expanded card system routines, and tape system routines. They are constructed in such a manner as to allow programs using them to be reassembled with an expanded card or tape system routine with a minimum of alteration.

To convert a program using a 4K printer routine to the use of an expanded system routine do the following:

(1) Remove the 4K printer routine source cards from the program deck.

(2) Redefine the output area used for the expanded routine retaining the area name XAP.

(3) If the tape assembler is to be used, insert the appropriate call to the PAL library specifying index register 3, and the output area name as XAP.

If the card assembler is to be used, insert the appropriate specializing EQU cards, specifying index register 3, and the output area name as XAP, followed by the expanded system card reader routine source deck.

(4) Insert the below EQU cards in front of the worker program, following the I/O deck. These cards equate the entrance labels of the 4K routine to the corresponding labels of the replacement routine.

CE		LABEL		OPERATION	OPERANDS
E 5	INS 6	7 11		13 18	19 30 40
		XIP		EQU	XINPR
		XXP		EQU	XCTPR
		XVP		EQU	XADVC
		XRP		EQU	XRMAR
		XQP		EQU	XCTQL
		XCP		EQU	XCLPR
		XUP		EQU	XCTAD

The assembly procedure is described in Section 3 of the "UNIVAC 1050 Card System Assembler Reference Manual", UP-3915-1.01.

2.4.2. Downward Compatibility

A program using an expanded system printer routine can be converted to use a 4K printer routine if the expand system routine uses index register 3.

To convert, proceed as follows:

(1) Remove the expanded system printer routine source deck and specializing EQU cards, or if a tape system print routine was used, the PAL library print routine call.

(2) Insert the following set of EQU cards followed by the required 4K printer routine:

CE	INS	LABEL	OPERATION	OPERANDS
5	6	7 11	13 18	19 30 40
		XAP	EQU	printer output area label
		XINPR	EQU	XIP
		XCTPR	EQU	XXP
		XADVC	EQU	XVP
		XRMAR	EQU	XRP
		XCTQL	EQU	XQP
		XCLPR	EQU	XCP
		XCTAD	EQU	XUP

The assembly procedure is described in Section 3 of the "UNIVAC 1050 Card System Assembler Reference Manual", UP-3915-1.01.

3. ERROR STOPS AND PROCEDURES

If a printer error condition occurs, the computer will be brought to an orderly stop with one of the following stop displays:

DISPLAY	CONDITION
30 107000 60	Paper low in the printer (8 K routine only). Load more paper.
30 100000 60	All other printer errors (see Table 1).

When recovery is attempted, the previous print or paper advance instruction will be reissued. Control is returned to the worker program.

REASON FOR STOP	INTERNAL INDICATOR	PRINTER PANEL LIGHT	RESULTING CONDITION	RECOVERY PROCEDURE
Offline	Nonready	Offline	Recoverable	Depress the OFFLINE, READY and PROGRAM START buttons.
Carriage out	Nonready	Carriage out	Recoverable	Depress the CARRIAGE IN button until carriage is completely in, then the READY and PROGRAM START buttons.
Ribbon out	Nonready	Ribbon out	Recoverable	Call technician. When ribbon is restored, depress the READY and PROGRAM START buttons.
Paper low	Paper low	Forms out	Recoverable	Depress READY, MANUAL PRINT, and PROGRAM START buttons. This will cause one line to be printed. Continue this procedure until all printing is finished for that page or until line advance between pages is executed, then reload new paper stock. Depress the MANUAL PRINT and PROGRAM START buttons, and the program will continue.
All others	Nonready	Overheat D.C. fault Forms runaway etc.	Nonrecoverable	If a recovery attempt is desired at the risk of a lost or duplicated line, clear the problem, and depress the READY and PROGRAM START buttons.

Table 2. Error Conditions and Recovery Procedures

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