

1. IDENTIFICATION
- 1.2 Digital-7-10-O
- 1.3 Teletype Output Package
- 1.3 January 7, 1965

2. ABSTRACT

This package includes subroutines which allow the user to type characters on line represented by 1, 3, or a string of codes. Routines are included to facilitate formatting by the user. The user must supply his own subroutine, OTY, to type out one Teletype character.

3. REQUIREMENTS

3.3 Equipment
Teleprinter

4. USAGE

4.1 Loading

The Teletype Output Package source tape should be assembled with the program which refers to it, or assembled using a symbol punch which contains the required subroutine calls (see Digital-7-3-S). In either case, the operation of the routines are independent of their position in memory. The user must supply a type-out routine, OTY, which is referred to by the package (see below).

4.2 Calling Sequence

The following calling sequences may be used to call the Teletype output subroutines.

Format Routines

TCR Type a carriage return and line feed.

TSP Type a space.

TYT Type a tab. Tab stops are located every TTAB spaces. This value is initially 10, but may be altered by the user. The subroutine counts the number of characters being printed on a line so that a TYT call will generate the proper number of spaces for a consistent format. TCR resets the character count to 0.

TIN Initialize the teleprinter. Type a carriage return, line feed, lower case, and set the character count to 0. TIN should be called before any other subroutines in the package.

Character Type-out Routines

TDIGIT Type the digit (code value from 0 to 9) in the right four bits of the AC.

TY1 Type the character represented by the code in the right six bits of the AC.

TY3 Type the three characters represented by the codes in left, middle, and right six bits of the AC, respectively.

LAW A

TSR Type the string of characters represented by the codes stored beginning in register A. A code having zeros in the leftmost five bits terminates the string.

All characters are typed by calling the subroutine OTY, which must be defined by the user. Two sequences are suggested, one for use with programs which use program interrupt for I/O service, and one for programs which do not.

NOTE: When using a Type 28 Teletype, TLS will type characters represented by 5-bit codes; when using a Type 33 Teletype, TLS will type from 8-bit codes.

The following subroutine works very well with interrupt programs where buffering is not needed:

```

OTY,          0
              TLS
              JMP
              JMP I OTY

TYINT,        TCF
              ISZ 0
              DISMISS

```

When using the associated program interrupt routine, an interrupt from the teleprinter should execute the command:

```
JMP TYINT
```

In addition, the symbol DISMISS should be defined as a JMP to the section of the interrupt routine which restores the AC and link and dismisses the program interrupt.

The following subroutine is suggested for noninterrupt programs:

```

OTY          0
            TLS
            TSF
            JMP .-1
            JMP I OTY

```

6. DESCRIPTION

6.1 Discussion

These routines assume that the codes which represent the characters to be typed consist of six bits. The leftmost five bits are the Baudot code for the character; the rightmost bit indicates the case of the character (1 for upper case, 0 for lower case). This format is generated by the PDP-7 Assembler's character input operations in Teletype mode (see Digital-7-3-5). The case of the Type 28 Teletype is automatically checked (and adjusted if necessary) when each character is typed. A code whose leftmost five bits are 0 is not printed.

When using a PDP-7 with KSR33 teleprinter, the 5-bit Teletype codes are translated to 8-bit Type 33 codes (ASCII plus 200) before printing. Case shifts on the KSR33 are nonexistent. References to case in this document may be ignored when using the KSR33.

WARNING

When using a Type 28 Teletype the routine keeps track of keyboard case and assumes it knows the case at all times. However, if the user is also using the keyboard for input, he may change the case without the routines knowing it, possibly causing hash at the next type-out. For this reason and also for convenience, it is suggested that the user keep track of case by using the same indicators the package uses.

The contents of the register OCS indicates the case of the teleprinter, 33_8 for upper case and 37_8 for lower case. If this is changed whenever a case shift is typed upon input, no problems of this type will be encountered.

10. PROGRAM

10.4 Program Listing

PDP-7 BTA

```
/TELETYPE OUTPUT PACKAGE 8-13-63  
XIT=LAC-JMS TTAB=10  
/TYPE 1 CHARACTER FROM AC BITS 12-17
```

TY1=JMS .

0
DAC TY→SVAC
RAR
JMS TY1A
XIT TY1
TYEXIT

/TYPE 1 CHARACTER (5 BIT), LINK INDICATES CASE
TY1A,

0
DAC T→EMY
AND (37
SNA
JMP TY2
703301
SKP
JMP TY1B
LAC OCL
SZL
LAC OCU
SAD OCS
JMP . 3
JMS OTY
DAC OCS
LAC TEMY
JMS OTY
ISZ T→BC
LAC TEMY
JMP I TY1A

TY2,

/TYPE 3 CHARACTERS FROM AC 0-5, 6-11,12-17 RESPECTIVELY
TY3=JMS .

0
DAC TYSVAC
JMS RI6
JMS TY1A
JMS RI6
JMS TY1A
JMS RI6
JMS TY1A
XIT TY3
TYEXIT

/TELETYPE OUTPACKAGE PAGE 2

/TYPE A CARRIAGE RETURN, AND LINE FEED
TCR=JMS .

0
DAC TYSVAC
703301
SKP
JMP TCRA
LAW 2
JMS OTY

LAW 10
JMS OTY
DZM TBC
XIT TCR
TYEXIT

/TYPE A SPACE
TSP=JMS .

0
DAC TYSVAC
LAW 4
703301
SKP
LAW 240
JMS OTY
ISZ TBC
XIT TSP
TYEXIT

/TYPE A TABULATION
TYT=JMS .

0
DAC TYSVAC
LAC TBC
ADD (1
TAD (-TTAB
SMA
JMP .-2
TAD (-1
DAC TEMY1
LAC TYSVAC
TSP
ISZ TEMY1
JMP .-2
XIT TYT
TYEXIT

/TELETYPE OUTPUT PACKAGE - PAGE 3
/TYPEWRITER INITIALIZE
TIN=JMS .

0
DAC TYSVAC
LAC OCL
DAC OCS
703301
SKP
JMP . 3
TLS

JMS OTY
LAC TYSVAC
TCR
JMP I TIN-JMS
/TYPE THE DIGIT IN THE AC
TDIGIT=JMS .

0
DAC TEMY₁
AND (17
ADD (LAC NCT
DAC . 1
XX
TY1
LAC TEMY₁

JMP TDIGIT-JMS
/TYPE A STRING OF CHARACTERS
TSR=JMS .

0
DAC T→EMY1
LAC I TEMY1
TY3
AND (76
ISZ TEMY₁
SZA
JMP TSR+2-JMS
LAC TEMY₁
JMP I TSR-JMS

/EXIT AFTER RESTORING AC AND LINK
TYEXIT JMP .
DAC TEMY

RAL
LAC TYSVAC
JMP I TEMY

/TELETYPE OUTPUT PACKAGE - PAGE 4
/ROTATE LEFT 6
RL6,

0
RTL
RTL
RTL
JMP I RL6

/TABLE OF DIGITS

NCT,	33	73	63	41	25
	3	53	71	31	7

/CASE STORAGE

OCU,	33
OCL,	37
OCS,	0

/END OF TELETYPE OUTPUT PACKAGE

/PDP-4/7 ADDENDUM

TY1B, ADD (LAC BTATAB-1
DAC . 1
XX
SZL
JMP TY1C
TY1D, JMS OTY
JMP TY2-1
TY1C, JMS RL6
RTL
RTL
JMP TY1D
TCRA, LAW 215
JMS OTY
LAW 212
JMP TCR-JMS 10

BTATAB, 265324 /5, T
215215 /CARRIAGE RETURN
271317 /9, O
240240 /SPACE
243310 /x, H
254316 /., N
256315 /., M
212212 /LINE FEED
251314 /), L
264322 /4, R
246307 /+, G
270311 /8, I
260320 /0, P
272303 /:, C
273326 /., V
263305 /3, E
242332 /\$, Z
244304 /D
277302 /?, B
211323 /BELL, S
266331 /6, Y
241306 /↑, F
257330 //, X
255301 /-, A
262327 /2, W
247312 /→, J
377377 /FIGURES
267325 /7, U
261321 /1, Q
250313 /(. K
377377 /LETTERS
START