

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-7-3-5). 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 be-  
ginning 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 inter-  
rupt 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<sub>8</sub> for upper case and 37<sub>8</sub> 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 TEMY<sub>1</sub>  
AND (17  
ADD (LAC NCT  
DAC . 1  
XX  
TY1  
LAC TEMY<sub>1</sub>

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

0  
DAC T→EMY1  
LAC I TEMY1  
TY3  
AND (76  
ISZ TEMY<sub>1</sub>  
SZA  
JMP TSR+2-JMS  
LAC TEMY<sub>1</sub>  
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 (IAC 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 /9,0  
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