1.	IDENTIFICATION
1.1	Teletype Output Subroutines
1.2	Digital-8-19-U-Sym
1.3	April 7, 1965

PDP
8
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2. ABSTRACT

A group of subroutines useful in controlling ASR-33 output is presented as a package. Provision is made for the simulation of tabulation stops. The distance "tabbed" may be controlled by the user. Characters whose ASR-33 codes are in the groups 241 through 277, inclusive, and 300 through 337, inclusive, are legal. Space, carriage return then line feed, and tabulation are provided via subroutines.

3. REQUIREMENTS

3.1 Storage

This collection of subroutines occupies 74 (decimal) core locations.

3.3 Equipment

Basi PDP-8

4. USAGE

4.1 Loading

This package may be placed in memory by the use of the Binary Loader. See Digital-8-2-Rim for a complete discussion of this loader.

4.2 Calling Sequence

All subroutines are called with a JMS instruction and return to the next location in core. Enter the character typeout subroutines with a single character in AC bits 6 through 11 or a pair of characters in AC bits 0 through 5 and 6 through 11, respectively. (The character in bits 0 through 5 will be typed first in the latter case.) Enter the digit typeout subroutine with the digit to be typed in AC bits 8, 9, 10, and 11. Other subroutines are merely called.

5. RESTRICTIONS

(Not Applicable)

6. DESCRIPTION

6.1 Discussion

This package uses short subroutines to type the formating characters, carriage return followed by line feed, space, and tabulate.

Other characters are represented internally by 6-bit codes so that two characters may be packed to a word. A short subroutine is used to convert the "trimmed" 6-bit code to the 8-bit code required for the ASR-33.

Digits are represented internally by a 4-bit code which must be in the AC (bits 8, 9, 10, and 11) on entry to the type digit subroutine. If a code greater than 1001 is present in AC bits 8, 9, 10, and 11 on entry, the subroutine merely returns to the calling sequence of instructions with no typeout.

Every time the minor subroutine which actually types a character or digit, tagged OTY, is used, a counter is incremented. When the tabulate subroutine is called, the contents of this counter are used to determine the remaining space to the next tab stop. Use of the tabulate or carriage return followed by line feed subroutines sets the contents of this counter to 0.

7. METHODS

Straightforward

8. FORMAT

For these subroutines external (ASCII) and internal core formats may best be illustrated by the following tables.

Characters Developed From Stored Code

00	300	@			
01	301	A	41	241	!
02	302	B	42	242	"
03	303	C	43	243	#
04	304	D	44	244	$
05	305	E	45	245	%
06	306	F	46	246	&
07	307	G	47	247	'
10	310	H	50	250	(
11	311	I	51	251	)
12	312	J	52	252	*
13	313	K	53	253	+
14	314	L	54	254	,
15	315	M	55	255	-
16	316	N	56	256	.
17	317	O	57	257	\
20	320	P	60	260	0
21	321	Q	61	261	1

22	322	R	62	262	2
23	323	S	63	263	3
24	324	T	64	264	4
25	325	U	65	265	5
26	326	V	66	266	6
27	327	W	67	267	7
30	330	X	70	270	8
31	331	Y	72	272	9
32	332	Z	72	272	:
33	333	[	73	273	;
34	334	/	74	274	<
35	335	]	75	275	=
36	336	↑	76	276	>
37	337	→	77	277	?

Characters Provided By Subroutines

carriage return then line feed
space
tabulation

All other ASCII characters are illegal in the sense that they can never be developed by these subroutines.

9. EXECUTION TIME

These subroutines are output limited.

10. PROGRAM

10.4 Program Listing

A listing of these subroutines with TYPE located in 0200 is as follows:

```
                /PDP-8 TELETYPE OUTPUT PACKAGE
0200    0000    TYPE,   0               /TYPE ONE CHARACTER
0201    0301            AND TTAB+1      /0077
0202    4260            JMS CON
0203    4266            JMS OTY
0204    5600            JMP I TYPE
0205    0000    TY2,    0               /TYPE TWO CHARACTERS
0206    3276            DCA TEMY
0207    1276            TAD TEMY
0210    7012            RTR
0211    7012            RTR
```

```
0212    7012            RTR
0213    4200            JMS TYPE
0214    1276            TAD TEMY
0215    4200            JMS TYPE
0216    5605            JMP I TY2
0217    0000    TYCR,   0               /TYPE C.R. AND L.F.
0220    7200            CLA
0221    1302            TAD TTAB+2      /0215
0222    4266            JMS OTY
0223    1303            TAD TTAB+3      /0212
0224    4266            JMS OTY
0225    3277            DCA TBC
0226    5617            JMP I TYCR
0227    0000    TYSP,   0               /TYPE A SPACE
0230    7200            CLA
0231    1304            TAD TTAB+4      /0240
0232    4266            JMS OTY
0233    5627            JMP I TYSP
0234    0000    TYTB,   0               /TYPE A TAB
0235    7200            CLA
0236    1277            TAD TBC
0237    1300            TAD TTAB        /-10 OR USER SET
0240    7500            SMA
0241    5237            JMP .-2
0242    3277            DCA TBC
0243    4227            JMS TYSP
0244    5243            JMP .-1
0245    0000    TDIG,   0               /TYPE A DIGIT
0246    0305            AND TTAB+5      /0017
0247    3276            DCA TEMY
0250    1276            TAD TEMY
0251    1306            TAD TTAB+6      /-12
0252    7700            SMA CLA
0253    5645            JMP I TDIG
0254    1276            TAD TEMY
0255    1307            TAD TTAB+7      /0260
0256    4266            JMS OTY
0257    5645            JMP I TDIG
0260    0000    CON,    0               /TRIMMED TO ASR 33
0261    7510            SPA
0262    7510            TAD TTAB+10     /-40
0263    1311            TAD TTAB+11     /0100
0264    1304            TAD TTAB+4      /0240
```

```
0265    5660            JMP I CON
0266    0000    OTY,    0               /ONE CH. OUT AND COUNT
0267    6046            TLS
0270    6041            TSF
0271    5270            JMP .-1
0272    7200            CLA
0273    2277            ISZ TBC
0274    5666            JMP I OTY
0275    5634            JMP I TYTB
0276    0000    TEMY,   0               /VARIABLES
0277    0000    TBC,    0
0300    7770    TTAB,   7770            /CONSTANTS
0301    0077            77
0302    0215            215
0303    0212            212
0304    0240            240
0305    0017            17
0306    7766            7766
0307    0260            260
0310    7740            7740
0311    0100            0100
CON         0260
OTY         0266
TBC         0277
TDIG        0245
TEMY        0276
TTAB        0300
TYCR        0217
TYPE        0200
TYSP        0227
TYTB        0234
TY2         0205
```

11. DIAGRAMS (Not Applicable)

12. REFERENCES (Not Applicable)

13. ADDENDA (Not Applicable)

14. ERRATA (Not Applicable)