

- 1. IDENTIFICATION
- 1.1 Digital-8-20-U-Sym
- 1.2 Character String Typeout
- 1.3 October 22, 1965



2. ABSTRACT

A basic subroutine to type messages stored internally as a string of coded characters. All ASR-33 characters are legal.

3. REQUIREMENTS

3.1 Storage

This subroutine uses 59 (decimal) core memory locations.

3.3 EQUIPMENT

Basic PDP-8

4. USAGE

4.1 Loading

This subroutine may be placed in core through the use of the Binary Loader, which is completely described in Digital-8-2-Rim. The library tape supplied is symbolic.

4.2 Calling Sequence

Call with a JMS with the starting address of the character string in the AC. Return will be to the instruction following the calling JMS.

5. RESTRICTIONS (Not Applicable)

6. DESCRIPTION

6.1 Discussion

The ASCII character set breaks naturally into two major groupings: characters represented by codes 240 through 277; and characters represented by codes 301 through 337. Characters with these codes may readily be handled by representing them internally as stripped 6-bit codes. See Digital-8-18-U-Sym and Digital-8-19-U-Sym for a complete discussion of how this is done.

The following are special characters:

<u>Character</u>	<u>Code</u>
EOT	204
WRU	205
RU	206
BELL	207
Line Feed	212
Return	215
@	300
ACK	374
ALT MODE	375
RUBOUT	377

These special characters are represented by codes which conflict with the groupings from 240 to 277 and 301 to 337. Consequently when these characters must be output, they are treated as exceptions and

developed by special methods as described in Digital-8-18-U-Sym and Digital-8-19-U-Sym. Neither of these programs permits the development of all the codes listed above. This program does.

## 7. METHODS

### 7.1 Discussion

Internally characters are represented as 6-bit stripped characters and are packed two to a word. The stripped character 00 is used to indicate that the following character is a special character. For example, @ may be developed by packing 0000.

Since the appearance of 00 indicates that the next 6-bit group is to receive special treatment, 64 special characters are possible. This is many more than necessary to accommodate the ten special characters listed above that are required for ASCII typeout. The 6-bit group 000001 is therefore used to indicate the end of a given character string since it is not needed for regular ASCII output.

The method is straightforward. The first message word is picked up and the two trimmed codes masked out. Two jumps to the subroutine tagged TSCC2 are made in order to type the two characters. TSCC2 tests first to determine if the special character flag is set indicating that the current character is special. If so, a JMP to TYPSP is executed. If not, a test is made to see if the current code is 00. If so, the special character flag is set but no typeout ensues. If not, a regular character is being processed and is typed.

The TYPSP section of coding processes special characters. The special characters may be classified as:

<u>Special Character</u>	<u>Comments</u>
300	Logically the lowest element of extended group 301 through 337.
374, 375, 377	Least significant two digits similar to those in group 240 to 277.
204, 205, 206 207, 212, 215	Least significant two digits similar to those in group 301 through 337.

In order to develop the correct output, TYPSP changes the SPA command in SWITCH to a SMA command for all special characters but 300.

## 8. FORMAT

### 8.4 Miscellaneous

Refer to Digital-8-18-U-Sym and Digital-8-19-U-Sym for further format and code description.

## 9. EXECUTION TIME (Not applicable)

10. PROGRAM

10.4 Program Listing

/DIGITAL 8-20-U  
/CHARACTER STRING TYPE-OUT  
/CALL WITH STRING ADDRESS IN  
/C(AC); ALL CODES MAY BE DEVELOPED  
/RETURN FOLLOWING THE JMS

0200	0000	TYPSTG,	0	
0201	3262		DCA TEMQ	/STORE INITIAL ADDRESS
0202	3264		DCA FLAG	/CLEAR FLAG
0203	1662	TSCC1,	TAD I TEMQ	/PICK UP DATA
0204	7012		RTR	/ROTATE 6 BITS RIGHT
0205	7012		RTR	
0206	7012		RTR	
0207	4214		JMS TSCC2	/TYPE FIRST CHARACTER
0210	1662		TAD I TEMQ	/PICK UP DATA
0211	4214		JMS TSCC2	/TYPE SECOND CHARACTER
0212	2262		ISZ TEMQ	/INCREMENT STORAGE ADDRESS
0213	5203		JMP TSCC1	/GO BACK FOR MORE
0214	0000	TSCC2,	0	
0215	0265		AND K77	/MASK OFF 6 BITS
0216	3263		DCA TEMR	/SAVE CHARACTER
0217	1264		TAD FLAG	/TEST "SPECIAL" FLAG
0220	7640		SZA CLA	
0221	5231		JMP TYPSP	/SET: TYPE SPECIAL
0222	1263		TAD TEMR	/NO: REGULAR CHARACTER
0223	7450		SNA	/IS IT ZERO?
0224	5227		JMP .+3	/YES: SET FLAG
0225	4250	TYPAT,	JMS PRINT	/NO: PRINT IT
0226	5614		JMP I TSCC2	/RETURN
0227	2264		ISZ FLAG	/SET "SPECIAL" FLAG
0230	5614		JMP I TSCC2	/EXIT
0231	3264	TYPSP,	DCA FLAG	/CLEAR "SPECIAL" FLAG
0232	1263		TAD TEMR	/TEST FOR "0"
0233	7041		CIA	
0234	7450		SNA	
0235	5225		JMP TYPAT	/0: TYPE "0"
0236	7001		IAC	/TEST FOR 01
0237	7650		SNA CLA	
0240	5600		JMP I TYPSTG	/YES: EXIT CODE
0241	1271		TAD SKIPMA	/ALTER INSTRUCTION
0242	3252		DCA SWITCH	/TO BE "SMA"
0243	1263		TAD TEMR	/TYPE CHARACTER
0244	4250		JMS PRINT	
0245	1272		TAD SKIPPA	/ALTER INSTRUCTION
0246	3252		DCA SWITCH	/TO BE "SPA"
0247	5614		JMP I TSCC2	/RETURN
0250	0000	PRINT,	0	
0251	1266		TAD M40	/COMPARE WITH 40
0252	7510	SWITCH,	SPA	/OR SMA FOR SPECIAL CODES

0253	1267	TAD C100
0254	1270	TAD C240
0255	6046	ILS
0256	6041	ISF
0257	5256	JMP .-1
0260	7200	CLA
0261	5650	JMP I PRINT

/CONSTANTS AND TEMPORARY REGISTERS

0262	0000	TEMQ,	0	/CONTAINS STRING ADDRESS
0263	0000	TEMR,	0	/CONTAINS 6 BIT CHARACTER
0264	0000	FLAG,	0	/"SPECIAL" FLAG
0265	0077	K77,	77	
0266	7740	M40,	-40	
0267	0100	C100,	100	
0270	0240	C240,	240	
0271	7500	SKIPMA,	SMA	
0272	7510	SKIPPA,	SPA	

C100	0267
C240	0270
FLAG	0264
K77	0265
M40	0266
PRINT	0250
SKIPMA	0271
SKIPPA	0272
SWITCH	0252
TEMQ	0262
TEMR	0263
TSCC1	0203
TSCC2	0214
TYPAT	0225
TYPSP	0231
TYPSTG	0200

11.           DIAGRAMS (Not Applicable)

12.           REFERENCES

12.1          Other Library Programs

Digital-8-18-U-Sym and Digital-8-19-U-Sym