

- 1. IDENTIFICATION
- 1.1 Digital-8-23-U-Sym
- 1.2 Signed Decimal Print, Single Precision
- 1.3 January 19, 1966

2. ABSTRACT

This subroutine permits the typeout of the contents of a computer word as a signed twos complement number. If bit 0 of the computer word is a "1", the remaining bits represent a negative integer in twos complement form; if bit 0 equals "0", the remaining bits represent a positive integer. If the number is negative, a minus sign is printed; if positive, a space.

3. REQUIREMENTS

3.1 Storage

This subroutine requires 51 core locations.

3.2 Subprograms and/or Subroutines (None)

3.3 Equipment

Basic PDP-8 with ASR-33

4. USAGE

4.1 Loading

The symbolic tape provided is in PAL III or MACRO-8 language. It may be assembled with the user's program or separately with the proper origin setting. Neither origin setting nor "\$" terminating character exists on the symbolic tape provided.

4.2 Calling Sequence

The subroutine is called by an effective "JMS SSPRNT" with the number to be printed in the AC. The return is to the location following that of the calling JMS. The contents of neither the AC nor the link are preserved, and return is with both active registers clear.

5. RESTRICTIONS (None)

6. DESCRIPTION

6.1 Discussion

This is a basic subroutine to obtain signed decimal output corresponding to binary words in memory stored in twos complement form. First, the number is sensed to determine if it is positive or negative. If positive, a space is printed. If negative, a minus sign is printed and the number complemented to form the absolute value in twos complement. Then, the same algorithm is followed as in the unsigned printout, (see Digital-8-22-U-Sym).

6.2 Examples and/or Applications (None)

6.3 Scaling

The numbers are interpreted and typed out as integers.

7. METHOD (See Digital-8-22-U-Sym)

8. FORMAT

8.1 Input Data (Not Applicable)

8.2 Core Data (Not Applicable)

8.3 Output Data

Output is in the form of four consecutive decimal digits preceded by either a space or minus sign. Spacing, tabulation, carriage return, etc., are not provided in this subroutine. See Digital-8-19-U-Sym which contains subroutines for those purposes.

9. EXECUTION TIME

9.1 Minimum (Not Applicable)

9.2 Maximum (Not Applicable)

9.3 Average

This subroutine is output limited at 10 cps by the ASR-33.

10. PROGRAM

10.1 Core Map (None)

10.2 Dimension List(s) (None)

10.3 Macro, Parameter, and Variable Lists (None)

10.4 Program Listing

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/BINARY TO DECIMAL CONVERSION AND TYPEOUT
/SINGLE PRECISION
/CALLING SEQUENCE:
/
JMS SSPRNT /SUBROUTINE CALL
/RETURN. AC AND L CLEAR

0200 0000 SSPRNT, 0
0201 7100 CLL
0202 7510 SPA /IS IS POSITIVE?
0203 7061 CML CMA IAC /NO, SET LINK, FORM ABSOLUTE VALUE
0204 3253 DCA SSVAL /STORE NUMBER AWAY
0205 3251 DCA SSBOX /SET DIGIT LOCATION TO ZERO
0206 1250 TAD SSCNTR /INITIALIZE OUTPUT COUNTER TO "4"
0207 3252 DCA SSCNT
0210 1244 TAD SSADDR /INITIALIZE INSTRUCTION TO GET FIRST 10
0211 3217 DCA SSXYZ+1
0212 1246 TAD SSPLUS /GET CODE TO TYPE A "PLUS"
0213 7430 SZL /IS THE NUMBER NEGATIVE?
0214 1247 TAD SSMNS /YES, CHANGE CODE TP TYPE A "MINUS"
0215 4235 JMS SSOUT /TYPE IT OUT
0216 1253 SSXYZ, TAD SSVAl /PICK UP NUMBER
0217 1254 TAD SSCON /SUBTRACT CURRENT POWER OF 10
0220 7510 SPA /IS THE RESULT NEGATIVE?

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0221	5225	JMP .+4	/YES, INDEXING IS FINISHED
0222	2251	ISZ SSBOX	/NO, INDEX THE DIGIT LOCATION
0223	3253	DCA SSVAl	/STORE REMAINDER IN SSVAl
0224	5216	JMP SSXYZ	/CONTINUE SUBTRACTING
0225	7200	CLA	
0226	1251	TAD SSBOX	/PICK UP THE DIGIT NUMBER
0227	4235	JMS SSOUT	/TYPE IT OUT
0230	3251	DCA SSBOX	/SET DIGIT COUNTER TO "0"
0231	2217	ISZ SSXYZ+1	/INDEX INSTRUCTION TO GET POWER OF 10
0232	2252	ISZ SSCNT	/HAVE WE TYPED "4" DIGITS
0233	5216	JMP SSXYZ	/NO, CONTINUE
0234	5600	JMP I SSPRNT	/YES, RETURN
		/TYPEOUT ROUTINE	
0235	0000	SSOUT, 0	
0236	1245	TAD SSTWO	
0237	6046	TL5	
0240	6041	TSF	
0241	5240	JMP , -1	
0242	7300	CLA CLL	
0243	5635	JMP I SSOUT	
0244	1254	SSADDR, TAD SSCON	/INSTRUCTION TO PICK UP FIRST POWER OF 0
0245	0260	SSTWO, 260	/BASIC CODE FOR DIGITAL OUTPUT
0246	7760	SSPLUS, -20	/NUMBER USED TO GENERATE "SPACE"
0247	0015	SSMNS, 15	/NUMBER USED TO GENERATE "MINUS"
0250	7774	SSCNTR, -4	/COUNT OF "4" DIGITS
0251	0000	SSBOX, 0	/STORAGE REGISTERS
0252	0000	SSCNT, 0	
0253	0000	SSVAL, 0	
		/TABLE OF POWERS OF 10	
0254	6030	SSCON, 6030	/-1000
0255	7634	7634	/-100
0256	7766	7766	/-10
0257	7777	7777	/-1
		PAUSE	

```
L
/TEST PROGRAM .SINGLE PREC. INPUT
RETURN=JMS I LINK1
PRINT=JMS I LINK2
SPRINT=JMS I LINK3
SPACE=JMS I LINK4
ACCEPT=JMS I LINK5
```

```
INIT,      RETURN
           ACCEPT
           DCA TEMP
           SPACE
           TAD TEMP
           PRINT
           SPACE
           TAD TEMP
           SPRINT
           RETURN
           JMP INIT+1

LINK1,     1217
LINK2,     DECPRT
LINK3,     SSPRNT
LINK4,     1227
LINK5,     SICONV
TEMP,      0
PAGE
PAUSE
```

Test Run - Starting at 0

0000	0001	0002	0003	0004	0005	0006	0007	0008	0009
0010	0011	0012	0013	0014	0015	0016	0017	0018	0019
0020	0021	0022	0023	0024	0025	0026	0027	0028	0029
0030	0031	0032	0033	0034	0035	0036	0037	0038	0039
0040	0041	0042	0043	0044	0045	0046	0047	0048	0049
0050	0051	0052	0053	0054	0055	0056	0057	0058	0059
0060	0061	0062	0063	0064	0065	0066	0067	0068	0069
0070	0071	0072	0073	0074	0075	0076	0077	0078	0079
0080	0081	0082	0083	0084	0085	0086	0087	0088	0089
0090	0091	0092	0093	0094	0095	0096	0097	0098	0099
0100	0101	0102	0103	0104	0105	0106	0107	0108	0109
0110	0111	0112	0113	0114	0115	0116	0117	0118	0119
0120	0121	0122	0123	0124	0125	0126	0127	0128	0129
0130	0131	0132	0133	0134	0135	0136	0137	0138	0139
0140	0141	0142	0143	0144	0145	0146	0147	0148	0149
0150	0151	0152	0153	0154	0155	0156	0157	0158	0159
0160	0161	0162	0163	0164	0165	0166	0167	0168	0169
0170	0171	0172	0173	0174	0175	0176	0177	0178	0179
0180	0181	0182	0183	0184	0185	0186	0187	0188	0189
0190	0191	0192	0193	0194	0195	0196	0197	0198	0199
0200	0201	0202	0203	0204	0205	0206	0207	0208	0209
0210	0211	0212	0213	0214	0215	0216	0217	0218	0219
0220	0221	0222	0223	0224	0225	0226	0227	0228	0229
0230	0231	0232	0233	0234	0235	0236	0237	0238	0239
0240	0241	0242	0243	0244	0245	0246	0247	0248	0249
0250	0251	0252	0253	0254	0255	0256	0257	0258	0259
0260	0261	0262	0263	0264	0265	0266	0267	0268	0269

0270	0271	0272	0273	0274	0275	0276	0277	0278	0279
0280	0281	0282	0283	0284	0285	0286	0287	0288	0289
0290	0291	0292	0293	0294	0295	0296	0297	0298	0299
0300	0301	0302	0303	0304	0305	0306	0307	0308	0309
0310	0311	0312	0313	0314	0315	0316	0317	0318	0319
0320	0321	0322	0323	0324	0325	0326	0327	0328	0329
0330	0331	0332	0333	0334	0335	0336	0337	0338	0339
0340	0341	0342	0343	0344	0345	0346	0347	0348	0349
0350	0351	0352	0353	0354	0355	0356	0357	0358	0359
0360	0361	0362	0363	0364	0365	0366	0367	0368	0369
0370	0371	0372	0373	0374	0375	0376	0377	0378	0379
0380	0381	0382	0383	0384	0385	0386	0387	0388	0389
0390	0391	0392	0393	0394	0395	0396	0397	0398	0399
0400	0401	0402	0403	0404	0405	0406	0407	0408	0409
0410	0411	0412	0413	0414	0415	0416	0417	0418	0419
0420	0421	0422	0423	0424	0425	0426	0427	0428	0429
0430	0431	0432	0433	0434	0435	0436	0437	0438	0439
0440	0441	0442	0443	0444	0445	0446	0447	0448	0449
0450	0451	0452	0453	0454	0455	0456	0457	0458	0459
0460	0461	0462	0463	0464	0465	0466	0467	0468	0469
0470	0471	0472	0473	0474	0475	0476	0477	0478	0479
0480	0481	0482	0483	0484	0485	0486	0487	0488	0489
0490	0491	0492	0493	0494	0495	0496	0497	0498	0499
0500	0501	0502	0503	0504	0505	0506	0507	0508	0509
0510	0511	0512	0513	0514	0515	0516	0517	0518	0519
0520	0521	0522	0523	0524	0525	0526	0527	0528	0529
0530	0531	0532	0533	0534	0535	0536	0537	0538	0539
0540	0541	0542	0543	0544	0545	0546	0547	0548	0549
0550	0551	0552	0553	0554	0555	0556	0557	0558	0559
0560	0561	0562	0563	0564	0565	0566	0567	0568	0569
0570	0571	0572	0573	0574	0575	0576	0577	0578	0579
0580	0581	0582	0583	0584	0585	0586	0587	0588	0589
0590	0591	0592	0593	0594	0595	0596	0597	0598	0599
0600	0601	0602	0603	0604	0605	0606	0607	0608	0609
0610	0611	0612	0613	0614	0615	0616	0617	0618	0619
0620	0621	0622	0623	0624	0625	0626	0627	0628	0629
0630	0631	0632	0633	0634	0635	0636	0637	0638	0639
0640	0641	0642	0643	0644	0645	0646	0647	0648	0649
0650	0651	0652	0653	0654	0655	0656	0657	0658	0659
0660	0661	0662	0663	0664	0665	0666	0667	0668	0669
0670	0671	0672	0673	0674	0675	0676	0677	0678	0679
0680	0681	0682	0683	0684	0685	0686	0687	0688	0689
0690	0691	0692	0693	0694	0695	0696	0697	0698	0699
0700	0701	0702	0703	0704	0705	0706	0707	0708	0709
0710	0711	0712	0713	0714	0715	0716	0717	0718	0719
0720	0721	0722	0723	0724	0725	0726	0727	0728	0729
0730	0731	0732	0733	0734	0735	0736	0737	0738	0739
0740	0741	0742	0743	0744	0745	0746	0747	0748	0749
0750	0751	0752	0753	0754	0755	0756	0757	0758	0759
0760	0761	0762	0763	0764	0765	0766	0767	0768	0769
0770	0771	0772	0773	0774	0775	0776	0777	0778	0779
0780	0781	0782	0783	0784	0785	0786	0787	0788	0789
0790	0791	0792	0793	0794	0795	0796	0797	0798	0799
0800	0801	0802	0803	0804	0805	0806	0807	0808	0809
0810	0811	0812	0813	0814	0815	0816	0817	0818	0819
0820	0821	0822	0823	0824	0825	0826	0827	0828	0829
0830	0831	0832	0833	0834	0835	0836	0837	0838	0839

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0840	0841	0842	0843	0844	0845	0846	0847	0848	0849
0850	0851	0852	0853	0854	0855	0856	0857	0858	0859
0860	0861	0862	0863	0864	0865	0866	0867	0868	0869
0870	0871	0872	0873	0874	0875	0876	0877	0878	0879
0880	0881	0882	0883	0884	0885	0886	0887	0888	0889
0890	0891	0892	0893	0894	0895	0896	0897	0898	0899
0900	0901	0902	0903	0904	0905	0906	0907	0908	0909
0910	0911	0912	0913	0914	0915	0916	0917	0918	0919
0920	0921	0922	0923	0924	0925	0926	0927	0928	0929
0930	0931	0932	0933	0934	0935	0936	0937	0938	0939
0940	0941	0942	0943	0944	0945	0946	0947	0948	0949
0950	0951	0952	0953	0954	0955	0956	0957	0958	0959
0960	0961	0962	0963	0964	0965	0966	0967	0968	0969
0970	0971	0972	0973	0974	0975	0976	0977	0978	0979
0980	0981	0982	0983	0984	0985	0986	0987	0988	0989
0990	0991	0992	0993	0994	0995	0996	0997	0998	0999
1000	1001	1002	1003	1004	1005	1006	1007	1008	1009
1010	1011	1012	1013	1014	1015	1016	1017	1018	1019
1020	1021	1022	1023	1024	1025	1026	1027	1028	1029
1030	1031	1032	1033	1034	1035	1036	1037	1038	1039
1040	1041	1042	1043	1044	1045	1046	1047	1048	1049
1050	1051	1052	1053	1054	1055	1056	1057	1058	1059
1060	1061	1062	1063	1064	1065	1066	1067	1068	1069
1070	1071	1072	1073	1074	1075	1076	1077	1078	1079
1080	1081	1082	1083	1084	1085	1086	1087	1088	1089
1090	1091	1092	1093	1094	1095	1096	1097	1098	1099
1100	1101	1102	1103	1104	1105	1106	1107	1108	1109
1110	1111	1112	1113	1114	1115	1116	1117	1118	1119
1120	1121	1122	1123	1124	1125	1126	1127	1128	1129
1130	1131	1132	1133	1134	1135	1136	1137	1138	1139
1140	1141	1142	1143	1144	1145	1146	1147	1148	1149
1150	1151	1152	1153	1154	1155	1156	1157	1158	1159
1160	1161	1162	1163	1164	1165	1166	1167	1168	1169
1170	1171	1172	1173	1174	1175	1176	1177	1178	1179
1180	1181	1182	1183	1184	1185	1186	1187	1188	1189
1190	1191	1192	1193	1194	1195	1196	1197	1198	1199
1200	1201	1202	1203	1204	1205	1206	1207	1208	1209
1210	1211	1212	1213	1214	1215	1216	1217	1218	1219
1220	1221	1222	1223	1224	1225	1226	1227	1228	1229
1230	1231	1232	1233	1234	1235	1236	1237	1238	1239
1240	1241	1242	1243	1244	1245	1246	1247	1248	1249
1250	1251	1252	1253	1254	1255	1256	1257	1258	1259
1260	1261	1262	1263	1264	1265	1266	1267	1268	1269
1270	1271	1272	1273	1274	1275	1276	1277	1278	1279
1280	1281	1282	1283	1284	1285	1286	1287	1288	1289
1290	1291	1292	1293	1294	1295	1296	1297	1298	1299
1300	1301	1302	1303	1304	1305	1306	1307	1308	1309
1310	1311	1312	1313	1314	1315	1316	1317	1318	1319
1320	1321	1322	1323	1324	1325	1326	1327	1328	1329
1330	1331	1332	1333	1334	1335	1336	1337	1338	1339
1340	1341	1342	1343	1344	1345	1346	1347	1348	1349
1350	1351	1352	1353	1354	1355	1356	1357	1358	1359
1360	1361	1362	1363	1364	1365	1366	1367	1368	1369
1370	1371	1372	1373	1374	1375	1376	1377	1378	1379
1380	1381	1382	1383	1384	1385	1386	1387	1388	1389
1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
1400	1401	1402	1403	1404	1405	1406	1407	1408	1409
1410	1411	1412	1413	1414	1415	1416	1417	1418	1419

1420	1421	1422	1423	1424	1425	1426	1427	1428	1429
1430	1431	1432	1433	1434	1435	1436	1437	1438	1439
1440	1441	1442	1443	1444	1445	1446	1447	1448	1449
1450	1451	1452	1453	1454	1455	1456	1457	1458	1459
1460	1461	1462	1463	1464	1465	1466	1467	1468	1469
1470	1471	1472	1473	1474	1475	1476	1477	1478	1479
1480	1481	1482	1483	1484	1485	1486	1487	1488	1489
1490	1491	1492	1493	1494	1495	1496	1497	1498	1499
1500	1501	1502	1503	1504	1505	1506	1507	1508	1509
1510	1511	1512	1513	1514	1515	1516	1517	1518	1519

NUMBER/ISZ I COUNT+0140 =2760 3700

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0200[G

0000	0001	0002	0003	0004	0005	0006	0007	0008	0009
0010	0011	0012	0013	0014	0015	0016	0017	0018	0019

Restarting near the change between positive and negative numbers.

NUMBER/AND 0024 3700

202[G

1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
2044	2045	2046	2047	-2048	-2047	-2046	-2045	-2044	-2043
-2042	-2041	-2040	-2039	-2038	-2037	-2036	-2035	-2034	-2033
-2032	-2031	-2030	-2029	-2028	-2027	-2026	-2025	-2024	-2023
-2022	-2021	-2020	-2019	-2018	-2017	-2016	-2015	-2014	-2013
-2012	-2011	-2010	-2009	-2008	-2007	-2006	-2005	-2004	-2003
-2002	-2001	-2000	-1999	-1998	-1997	-1996	-1995	-1994	-1993
-1992	-1991	-1990	-1989	-1988	-1987	-1986	-1985	-1984	-1983
-1982	-1981	-1980	-1979	-1978	-1977	-1976	-1975	-1974	-1973

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Restarting near -0.

NUMBER/JMS 0114 =4114 7700

202[G

-0064	-0063	-0062	-0061	-0060	-0059	-0058	-0057	-0056	-0055
-0054	-0053	-0052	-0051	-0050	-0049	-0048	-0047	-0046	-0045
-0044	-0043	-0042	-0041	-0040	-0039	-0038	-0037	-0036	-0035
-0034	-0033	-0032	-0031	-0030	-0029	-0028	-0027	-0026	-0025
-0024	-0023	-0022	-0021	-0020	-0019	-0018	-0017	-0016	-0015
-0014	-0013	-0012	-0011	-0010	-0009	-0008	-0007	-0006	-0005
-0004	-0003	-0002	-0001						

11 DIAGRAMS

11.1 Flow Charts

