

Motorola Semiconductor Engineering Bulletin

EB372

Template for Initializing the Exception Vector Table of CPU16-Based Devices

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Introduction

The assembly language program listed in this engineering bulletin is a template for initializing all of the exception and interrupt vectors in a CPU16-based device.

The Program

The program starts at \$00 0000 because the exception vector table always starts at that address from the release of RESET. The exception vector table for CPU16-based devices is always located at \$00 0000 and cannot be relocated.

The first part of the program consists of four `dc .w` directives that specify the initial values of the K register, initial stack pointer, initial program counter, and initial IZ values. Then, 252 `dc .w` declarations simply define a word for labels `v4` through `v255`.

The first word value will be at address \$00 0000, the second word at \$00 0002, the third word at \$00 0004, and so on.

When the program is assembled, the assembler will find each label and assign an address to it. For instance, the assembler will find the label `v5`, which is the label for the bus error handler, and put the address of that



label in location \$00 000A. This is the purpose of the `dw v5 ;Bus Error` directive at line 12 of the listing file in this bulletin. Likewise, addresses will be assigned to each of the labels and those addresses will be appropriately substituted for the label names for all of the "dw label" directives at lines 7 through 264 in the listing file here.

The second part of the program simply puts an `rti` instruction at each label except for the initial K register, initial stack pointer, initial program counter, and initial IZ register values.

The initial K register, initial stack pointer, initial program counter, and initial IZ register values must be supplied by modifying the first four `dc.w` statements in the assembly file.

When the program is assembled, an absolute address for all the labels will be calculated. Then, these values are used in the `dc.w` statements. Thus, the address of `v4` will be placed at memory location \$00 0008, the address of `v5` at \$00 000A, the address of `v6` at \$00 000C and so on. When a particular exception or interrupt occurs, the machine will fetch the associated vector number. The vector number is left shifted by one place for word alignment and then "zero extended" to become the address of the exception vector.

In other words, when a BERR exception occurs, the machine will fetch vector number 5. The machine will go to memory location \$00 000A. The contents of this memory location is the address of the label `v5` which is the BERR exception handler.

To use this template to initialize the exception vector table, follow these steps:

1. Cut and paste the assembly file into the first part of the user application.
2. Put in the appropriate values for the initial K register, initial program counter, initial stack pointer, and the initial IZ register.
3. Put in exception handler code at each label for which an exception handler is needed. This code will replace the RTI instruction that is at the label now. For instance, a BERR exception handler starts at label `v5`. The spurious interrupt handler starts a label `v24`. User defined vector 0 starts at label `v56`. Be sure to end the exception handler with an RTI instruction.

**Exception Vector
Initialization
Program
Listing File**

The following is the listing file for the exception vector initialization program. The assembly source code follows this listing file.

ASM16VEC.ASM

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```

1
2
00000 3      org $0000
4
5
6
00000 0F00 7      dw    $0f00  ;Initial ZK, SK and PK
8          ;Replace with correct user value
00002 0200 9      dw    $0200  ;Initial Program Counter
10         ;Replace with correct user value
00004 3FFC 11     dw    $3ffc  ;Initial Stack Pointer
12         ;Replace with correct user value
00006 F000 13     dw    $f000  ;Initial IZ Register
14         ;Replace with correct user value
00008 0208 15     dw    v4     ;Breakpoint
0000A 020A 16     dw    v5     ;Bus Error
0000C 020C 17     dw    v6     ;SWI Software Interrupt
0000E 020E 18     dw    v7     ;Illegal Instruction
00010 0210 19     dw    v8     ;Division By Zero
00012 0212 20     dw    v9     ;Unassigned, Reserved
00014 0214 21     dw    v10    ;Unassigned, Reserved
00016 0216 22     dw    v11    ;Unassigned, Reserved
00018 0218 23     dw    v12    ;Unassigned, Reserved
0001A 021A 24     dw    v13    ;Unassigned, Reserved
0001C 021C 25     dw    v14    ;Unassigned, Reserved
0001E 021E 26     dw    v15    ;Uninitialized Interrupt
00020 0220 27     dw    v16    ;Unassigned
00022 0222 28     dw    v17    ;Level 1 Interrupt Autovector
00024 0224 29     dw    v18    ;Level 2 Interrupt Autovector
00026 0226 30     dw    v19    ;Level 3 Interrupt Autovector
00028 0228 31     dw    v20    ;Level 4 Interrupt Autovector
0002A 022A 32     dw    v21    ;Level 5 Interrupt Autovector
0002C 022C 33     dw    v22    ;Level 6 Interrupt Autovector
0002E 022E 34     dw    v23    ;Level 7 Interrupt Autovector
00030 0230 35     dw    v24    ;Spurious Interrupt
00032 0232 36     dw    v25    ;Unassigned, Reserved
00034 0234 37     dw    v26    ;Unassigned, Reserved
00036 0236 38     dw    v27    ;Unassigned, Reserved
00038 0238 39     dw    v28    ;Unassigned, Reserved
0003A 023A 40     dw    v29    ;Unassigned, Reserved
0003C 023C 41     dw    v30    ;Unassigned, Reserved
0003E 023E 42     dw    v31    ;Unassigned, Reserved
00040 0240 43     dw    v32    ;Unassigned, Reserved
00042 0242 44     dw    v33    ;Unassigned, Reserved
00044 0244 45     dw    v34    ;Unassigned, Reserved

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00046	0246	46	dw	v35	;Unassigned, Reserved
00048	0248	47	dw	v36	;Unassigned, Reserved
0004A	024A	48	dw	v37	;Unassigned, Reserved
0004C	024C	49	dw	v38	;Unassigned, Reserved
0004E	024E	50	dw	v39	;Unassigned, Reserved
00050	0250	51	dw	v40	;Unassigned, Reserved
00052	0252	52	dw	v41	;Unassigned, Reserved
00054	0254	53	dw	v42	;Unassigned, Reserved
00056	0256	54	dw	v43	;Unassigned, Reserved

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00058	0258	55	dw	v44	;Unassigned, Reserved
0005A	025A	56	dw	v45	;Unassigned, Reserved
0005C	025C	57	dw	v46	;Unassigned, Reserved
0005E	025E	58	dw	v47	;Unassigned, Reserved
00060	0260	59	dw	v48	;Unassigned, Reserved
00062	0262	60	dw	v49	;Unassigned, Reserved
00064	0264	61	dw	v50	;Unassigned, Reserved
00066	0266	62	dw	v51	;Unassigned, Reserved
00068	0268	63	dw	v52	;Unassigned, Reserved
0006A	026A	64	dw	v53	;Unassigned, Reserved
0006C	026C	65	dw	v54	;Unassigned, Reserved
0006E	026E	66	dw	v55	;Unassigned, Reserved
		67			
		68			
00070	0270	69	dw	v56	;User Defined Vector 0
00072	0272	70	dw	v57	;User Defined Vector 1
00074	0274	71	dw	v58	;User Defined Vector 2
00076	0276	72	dw	v59	;User Defined Vector 3
00078	0278	73	dw	v60	;User Defined Vector 4
0007A	027A	74	dw	v61	;User Defined Vector 5
0007C	027C	75	dw	v62	;User Defined Vector 6
0007E	027E	76	dw	v63	;User Defined Vector 7
00080	0280	77	dw	v64	;User Defined Vector 8
00082	0282	78	dw	v65	;User Defined Vector 9
00084	0284	79	dw	v66	;User Defined Vector 10
00086	0286	80	dw	v67	;User Defined Vector 11
00088	0288	81	dw	v68	;User Defined Vector 12
0008A	028A	82	dw	v69	;User Defined Vector 13
0008C	028C	83	dw	v70	;User Defined Vector 14
0008E	028E	84	dw	v71	;User Defined Vector 15
00090	0290	85	dw	v72	;User Defined Vector 16
00092	0292	86	dw	v73	;User Defined Vector 17
00094	0294	87	dw	v74	;User Defined Vector 18
00096	0296	88	dw	v75	;User Defined Vector 19
00098	0298	89	dw	v76	;User Defined Vector 20
0009A	029A	90	dw	v77	;User Defined Vector 22
0009C	029C	91	dw	v78	;User Defined Vector 23
0009E	029E	92	dw	v79	;User Defined Vector 24
000A0	02A0	93	dw	v80	;User Defined Vector 25

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000A2	02A2	94	dw	v81	;User Defined Vector	26
000A4	02A4	95	dw	v82	;User Defined Vector	27
000A6	02A6	96	dw	v83	;User Defined Vector	28
000A8	02A8	97	dw	v84	;User Defined Vector	29
000AA	02AA	98	dw	v85	;User Defined Vector	30
000AC	02AC	99	dw	v86	;User Defined Vector	31
000AE	02AE	100	dw	v87	;User Defined Vector	32
000B0	02B0	101	dw	v88	;User Defined Vector	33
000B2	02B2	102	dw	v89	;User Defined Vector	34
000B4	02B4	103	dw	v90	;User Defined Vector	35
000B6	02B6	104	dw	v91	;User Defined Vector	36
000B8	02B8	105	dw	v92	;User Defined Vector	37
000BA	02BA	106	dw	v93	;User Defined Vector	38
000BC	02BC	107	dw	v94	;User Defined Vector	39
000BE	02BE	108	dw	v95	;User Defined Vector	40
000C0	02C0	109	dw	v96	;User Defined Vector	41
000C2	02C2	110	dw	v97	;User Defined Vector	42
000C4	02C4	111	dw	v98	;User Defined Vector	43
000C6	02C6	112	dw	v99	;User Defined Vector	44

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000C8	02C8	113	dw	v100	;User Defined Vector	45
000CA	02CA	114	dw	v101	;User Defined Vector	46
000CC	02CC	115	dw	v102	;User Defined Vector	47
000CE	02CE	116	dw	v103	;User Defined Vector	48
000D0	02D0	117	dw	v104	;User Defined Vector	49
000D2	02D2	118	dw	v105	;User Defined Vector	50
000D4	02D4	119	dw	v106	;User Defined Vector	51
000D6	02D6	120	dw	v107	;User Defined Vector	52
000D8	02D8	121	dw	v108	;User Defined Vector	53
000DA	02DA	122	dw	v109	;User Defined Vector	54
000DC	02DC	123	dw	v110	;User Defined Vector	55
000DE	02DE	124	dw	v111	;User Defined Vector	56
000E0	02E0	125	dw	v112	;User Defined Vector	57
000E2	02E2	126	dw	v113	;User Defined Vector	58
000E4	02E4	127	dw	v114	;User Defined Vector	59
000E6	02E6	128	dw	v115	;User Defined Vector	60
000E8	02E8	129	dw	v116	;User Defined Vector	61
000EA	02EA	130	dw	v117	;User Defined Vector	62
000EC	02EC	131	dw	v118	;User Defined Vector	63
000EE	02EE	132	dw	v119	;User Defined Vector	64
000F0	02F0	133	dw	v120	;User Defined Vector	65
000F2	02F2	134	dw	v121	;User Defined Vector	66
000F4	02F4	135	dw	v122	;User Defined Vector	67
000F6	02F6	136	dw	v123	;User Defined Vector	68
000F8	02F8	137	dw	v124	;User Defined Vector	69
000FA	02FA	138	dw	v125	;User Defined Vector	70
000FC	02FC	139	dw	v126	;User Defined Vector	71
000FE	02FE	140	dw	v127	;User Defined Vector	72
00100	0300	141	dw	v128	;User Defined Vector	73

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00102	0302	142	dw	v129	;User Defined Vector	74
00104	0304	143	dw	v130	;User Defined Vector	75
00106	0306	144	dw	v131	;User Defined Vector	76
00108	0308	145	dw	v132	;User Defined Vector	77
0010A	030A	146	dw	v133	;User Defined Vector	78
0010C	030C	147	dw	v134	;User Defined Vector	79
0010E	030E	148	dw	v135	;User Defined Vector	80
00110	0310	149	dw	v136	;User Defined Vector	81
00112	0312	150	dw	v137	;User Defined Vector	82
00114	0314	151	dw	v138	;User Defined Vector	83
00116	0316	152	dw	v139	;User Defined Vector	84
00118	0318	153	dw	v140	;User Defined Vector	85
0011A	031A	154	dw	v141	;User Defined Vector	86
0011C	031C	155	dw	v142	;User Defined Vector	87
0011E	031E	156	dw	v143	;User Defined Vector	88
00120	0320	157	dw	v144	;User Defined Vector	89
00122	0322	158	dw	v145	;User Defined Vector	90
00124	0324	159	dw	v146	;User Defined Vector	91
00126	0326	160	dw	v147	;User Defined Vector	92
00128	0328	161	dw	v148	;User Defined Vector	93
0012A	032A	162	dw	v149	;User Defined Vector	94
0012C	032C	163	dw	v150	;User Defined Vector	95
0012E	032E	164	dw	v151	;User Defined Vector	96
00130	0330	165	dw	v152	;User Defined Vector	97
00132	0332	166	dw	v153	;User Defined Vector	98
00134	0334	167	dw	v154	;User Defined Vector	99
00136	0336	168	dw	v155	;User Defined Vector	100
00138	0338	169	dw	v156	;User Defined Vector	101
0013A	033A	170	dw	v157	;User Defined Vector	102

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0013C	033C	171	dw	v158	;User Defined Vector	103
0013E	033E	172	dw	v159	;User Defined Vector	104
00140	0340	173	dw	v160	;User Defined Vector	105
00142	0342	174	dw	v161	;User Defined Vector	106
00144	0344	175	dw	v162	;User Defined Vector	107
00146	0346	176	dw	v163	;User Defined Vector	108
00148	0348	177	dw	v164	;User Defined Vector	109
0014A	034A	178	dw	v165	;User Defined Vector	110
0014C	034C	179	dw	v166	;User Defined Vector	111
0014E	034E	180	dw	v167	;User Defined Vector	112
00150	0350	181	dw	v168	;User Defined Vector	113
00152	0352	182	dw	v169	;User Defined Vector	114
00154	0354	183	dw	v170	;User Defined Vector	115
00156	0356	184	dw	v171	;User Defined Vector	116
00158	0358	185	dw	v172	;User Defined Vector	117
0015A	035A	186	dw	v173	;User Defined Vector	118
0015C	035C	187	dw	v174	;User Defined Vector	119
0015E	035E	188	dw	v175	;User Defined Vector	120
00160	0360	189	dw	v176	;User Defined Vector	121

00162	0362	190	dw	v177	;User Defined Vector	122
00164	0364	191	dw	v178	;User Defined Vector	123
00166	0366	192	dw	v179	;User Defined Vector	124
00168	0368	193	dw	v180	;User Defined Vector	125
0016A	036A	194	dw	v181	;User Defined Vector	126
0016C	036C	195	dw	v182	;User Defined Vector	127
0016E	036E	196	dw	v183	;User Defined Vector	128
00170	0370	197	dw	v184	;User Defined Vector	129
00172	0372	198	dw	v185	;User Defined Vector	130
00174	0374	199	dw	v186	;User Defined Vector	131
00176	0376	200	dw	v187	;User Defined Vector	132
00178	0378	201	dw	v188	;User Defined Vector	133
0017A	037A	202	dw	v189	;User Defined Vector	134
0017C	037C	203	dw	v190	;User Defined Vector	135
0017E	037E	204	dw	v191	;User Defined Vector	136
00180	0380	205	dw	v192	;User Defined Vector	137
00182	0382	206	dw	v193	;User Defined Vector	138
00184	0384	207	dw	v194	;User Defined Vector	139
00186	0386	208	dw	v195	;User Defined Vector	140
00188	0388	209	dw	v196	;User Defined Vector	141
0018A	038A	210	dw	v197	;User Defined Vector	142
0018C	038C	211	dw	v198	;User Defined Vector	143
0018E	038E	212	dw	v199	;User Defined Vector	144
00190	0390	213	dw	v200	;User Defined Vector	145
00192	0392	214	dw	v201	;User Defined Vector	146
00194	0394	215	dw	v202	;User Defined Vector	147
00196	0396	216	dw	v203	;User Defined Vector	148
00198	0398	217	dw	v204	;User Defined Vector	149
0019A	039A	218	dw	v205	;User Defined Vector	150
0019C	039C	219	dw	v206	;User Defined Vector	151
0019E	039E	220	dw	v207	;User Defined Vector	152
001A0	03A0	221	dw	v208	;User Defined Vector	153
001A2	03A2	222	dw	v209	;User Defined Vector	154
001A4	03A4	223	dw	v210	;User Defined Vector	155
001A6	03A6	224	dw	v211	;User Defined Vector	156
001A8	03A8	225	dw	v212	;User Defined Vector	157
001AA	03AA	226	dw	v213	;User Defined Vector	158
001AC	03AC	227	dw	v214	;User Defined Vector	159
001AE	03AE	228	dw	v215	;User Defined Vector	160

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001B0	03B0	229	dw	v216	;User Defined Vector	161
001B2	03B2	230	dw	v217	;User Defined Vector	162
001B4	03B4	231	dw	v218	;User Defined Vector	163
001B6	03B6	232	dw	v219	;User Defined Vector	164
001B8	03B8	233	dw	v220	;User Defined Vector	165
001BA	03BA	234	dw	v221	;User Defined Vector	166
001BC	03BC	235	dw	v222	;User Defined Vector	167
001BE	03BE	236	dw	v223	;User Defined Vector	168
001C0	03C0	237	dw	v224	;User Defined Vector	169

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001C2      03C2      238          dw      v225      ;User Defined Vector 170
001C4      03C4      239          dw      v226      ;User Defined Vector 171
001C6      03C6      240          dw      v227      ;User Defined Vector 172
001C8      03C8      241          dw      v228      ;User Defined Vector 173
001CA      03CA      242          dw      v229      ;User Defined Vector 174
001CC      03CC      243          dw      v230      ;User Defined Vector 175
001CE      03CE      244          dw      v231      ;User Defined Vector 176
001D0      03D0      245          dw      v232      ;User Defined Vector 177
001D2      03D2      246          dw      v233      ;User Defined Vector 178
001D4      03D4      247          dw      v234      ;User Defined Vector 179
001D6      03D6      248          dw      v235      ;User Defined Vector 180
001D8      03D8      249          dw      v236      ;User Defined Vector 181
001DA      03DA      250          dw      v237      ;User Defined Vector 182
001DC      03DC      251          dw      v238      ;User Defined Vector 183
001DE      03DE      252          dw      v239      ;User Defined Vector 184
001E0      03E0      253          dw      v240      ;User Defined Vector 185
001E2      03E2      254          dw      v241      ;User Defined Vector 186
001E4      03E4      255          dw      v242      ;User Defined Vector 187
001E6      03E6      256          dw      v243      ;User Defined Vector 188
001E8      03E8      257          dw      v244      ;User Defined Vector 189
001EA      03EA      258          dw      v245      ;User Defined Vector 190
001EC      03EC      259          dw      v246      ;User Defined Vector 191
001EE      03EE      260          dw      v247      ;User Defined Vector 192
001F0      03F0      261          dw      v248      ;User Defined Vector 193
001F2      03F2      262          dw      v249      ;User Defined Vector 194
001F4      03F4      263          dw      v250      ;User Defined Vector 195
001F6      03F6      264          dw      v251      ;User Defined Vector 196
001F8      03F8      265          dw      v252      ;User Defined Vector 197
001FA      03FA      266          dw      v253      ;User Defined Vector 198
001FC      03FC      267          dw      v254      ;User Defined Vector 199
001FE      03FE      268          dw      v255      ;User Defined Vector 200
           269
           270
           271
00200      272          org $0200      ;Location $200 is the first address
           273          ;after the exception vector table.
           274          ;The org statement could be anywhere
           275          ;in memory.
           276
           277
           278
00200      0000      279  v0      fcb $00,$00      ;Reset: Initial ZK, SK and PK
00202      0200      280  v1      fcb $02,$00      ;Reset: Initial Program counter
00204      3FFC      281  v2      fcb $3f,$fc      ;Reset: Initial Stack

```

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```

           Pointer
00206      F000      282  v3      fcb $f0,$00      ;Reset: Initial IZ Register
           283          ;The values at v0, v1, v2 and v3 are
           284          ;never used.They are simply put here

```


		285			;as place holders so that the lable	
		286			;v4 will start at address \$xxx8	
00208	[12]	2777	287	v4	rti	;Breakpoint
0020A	[12]	2777	288	v5	rti	;BERR
0020C	[12]	2777	289	v6	rti	;Software Interrupt
0020E	[12]	2777	290	v7	rti	;Illegal Instruction
00210	[12]	2777	291	v8	rti	;Division by Zero
00212	[12]	2777	292	v9	rti	;Unassigned
00214	[12]	2777	293	v10	rti	;Unassigned
00216	[12]	2777	294	v11	rti	;Unassigned
00218	[12]	2777	295	v12	rti	;Unassigned
0021A	[12]	2777	296	v13	rti	;Unassigned
0021C	[12]	2777	297	v14	rti	;Unassigned
0021E	[12]	2777	298	v15	rti	;Unitialized Interrupt
00220	[12]	2777	299	v16	rti	;Unassigned
00222	[12]	2777	300	v17	rti	;Level 1 Autovector
00224	[12]	2777	301	v18	rti	;Level 2 Autovector
00226	[12]	2777	302	v19	rti	;Level 3 Autovector
00228	[12]	2777	303	v20	rti	;Level 4 Autovector
0022A	[12]	2777	304	v21	rti	;Level 5 Autovector
0022C	[12]	2777	305	v22	rti	;Level 6 Autovector
0022E	[12]	2777	306	v23	rti	;Level 7 Autovector
00230	[12]	2777	307	v24	rti	;Spurious Interrupt
00232	[12]	2777	308	v25	rti	;Unassigned, Reserved
00234	[12]	2777	309	v26	rti	;Unassigned, Reserved
00236	[12]	2777	310	v27	rti	;Unassigned, Reserved
00238	[12]	2777	311	v28	rti	;Unassigned, Reserved
0023A	[12]	2777	312	v29	rti	;Unassigned, Reserved
0023C	[12]	2777	313	v30	rti	;Unassigned, Reserved
0023E	[12]	2777	314	v31	rti	;Unassigned, Reserved
00240	[12]	2777	315	v32	rti	;Unassigned, Reserved
00242	[12]	2777	316	v33	rti	;Unassigned, Reserved
00244	[12]	2777	317	v34	rti	;Unassigned, Reserved
00246	[12]	2777	318	v35	rti	;Unassigned, Reserved
00248	[12]	2777	319	v36	rti	;Unassigned, Reserved
0024A	[12]	2777	320	v37	rti	;Unassigned, Reserved
0024C	[12]	2777	321	v38	rti	;Unassigned, Reserved
0024E	[12]	2777	322	v39	rti	;Unassigned, Reserved
00250	[12]	2777	323	v40	rti	;Unassigned, Reserved
00252	[12]	2777	324	v41	rti	;Unassigned, Reserved
00254	[12]	2777	325	v42	rti	;Unassigned, Reserved
00256	[12]	2777	326	v43	rti	;Unassigned, Reserved
00258	[12]	2777	327	v44	rti	;Unassigned, Reserved
0025A	[12]	2777	328	v45	rti	;Unassigned, Reserved
0025C	[12]	2777	329	v46	rti	;Unassigned, Reserved
0025E	[12]	2777	330	v47	rti	;Unassigned, Reserved
00260	[12]	2777	331	v48	rti	;Unassigned, Reserved
00262	[12]	2777	332	v49	rti	;Unassigned, Reserved
00264	[12]	2777	333	v50	rti	;Unassigned, Reserved
00266	[12]	2777	334	v51	rti	;Unassigned, Reserved

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00268 [12] 2777      335 v52   rti      ;Unassigned, Reserved
0026A [12] 2777      336 v53   rti      ;Unassigned, Reserved
0026C [12] 2777      337 v54   rti      ;Unassigned, Reserved
0026E [12] 2777      338 v55   rti      ;Unassigned, Reserved
00270 [12] 2777      339 v56   rti      ;User Vector 0
00272 [12] 2777      340 v57   rti      ;User Vector 1
00274 [12] 2777      341 v58   rti      ;User Vector 2
00276 [12] 2777      342 v59   rti      ;User Vector 3
00278 [12] 2777      343 v60   rti      ;User Vector 4
0027A [12] 2777      344 v61   rti      ;User Vector 5
0027C [12] 2777      345 v62   rti      ;User Vector 6
0027E [12] 2777      346 v63   rti      ;User Vector 7
00280 [12] 2777      347 v64   rti      ;User Vector 8
00282 [12] 2777      348 v65   rti      ;User Vector 9
00284 [12] 2777      349 v66   rti      ;User Vector 10
00286 [12] 2777      350 v67   rti      ;User Vector 12
00288 [12] 2777      351 v68   rti      ;User Vector 13
0028A [12] 2777      352 v69   rti      ;User Vector 14
0028C [12] 2777      353 v70   rti      ;User Vector 15
0028E [12] 2777      354 v71   rti      ;User Vector 16
00290 [12] 2777      355 v72   rti      ;User Vector 17
00292 [12] 2777      356 v73   rti      ;User Vector 18
00294 [12] 2777      357 v74   rti      ;User Vector 19
00296 [12] 2777      358 v75   rti      ;User Vector 20
00298 [12] 2777      359 v76   rti      ;User Vector 21
0029A [12] 2777      360 v77   rti      ;User Vector 22
0029C [12] 2777      361 v78   rti      ;User Vector 23
0029E [12] 2777      362 v79   rti      ;User Vector 24
002A0 [12] 2777      363 v80   rti      ;User Vector 25
002A2 [12] 2777      364 v81   rti      ;User Vector 26
002A4 [12] 2777      365 v82   rti      ;User Vector 27
002A6 [12] 2777      366 v83   rti      ;User Vector 28
002A8 [12] 2777      367 v84   rti      ;User Vector 29
002AA [12] 2777      368 v85   rti      ;User Vector 30
002AC [12] 2777      369 v86   rti      ;User Vector 31
002AE [12] 2777      370 v87   rti      ;User Vector 32
002B0 [12] 2777      371 v88   rti      ;User Vector 33
002B2 [12] 2777      372 v89   rti      ;User Vector 34
002B4 [12] 2777      373 v90   rti      ;User Vector 35
002B6 [12] 2777      374 v91   rti      ;User Vector 36
002B8 [12] 2777      375 v92   rti      ;User Vector 37
002BA [12] 2777      376 v93   rti      ;User Vector 38
002BC [12] 2777      377 v94   rti      ;User Vector 39
002BE [12] 2777      378 v95   rti      ;User Vector 40
002C0 [12] 2777      379 v96   rti      ;User Vector 41
002C2 [12] 2777      380 v97   rti      ;User Vector 42
002C4 [12] 2777      381 v98   rti      ;User Vector 43
002C6 [12] 2777      382 v99   rti      ;User Vector 44
002C8 [12] 2777      383 v100  rti      ;User Vector 45
002CA [12] 2777      384 v101  rti      ;User Vector 46
002CC [12] 2777      385 v102  rti      ;User Vector 47

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002CE [12] 2777      386 v103   rti      ;User Vector 48
002D0 [12] 2777      387 v104   rti      ;User Vector 49
002D2 [12] 2777      388 v105   rti      ;User Vector 50
002D4 [12] 2777      389 v106   rti      ;User Vector 51
002D6 [12] 2777      390 v107   rti      ;User Vector 52
002D8 [12] 2777      391 v108   rti      ;User Vector 53
002DA [12] 2777      392 v109   rti      ;User Vector 54

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002DC [12] 2777      393 v110   rti      ;User Vector 55
002DE [12] 2777      394 v111   rti      ;User Vector 56
002E0 [12] 2777      395 v112   rti      ;User Vector 57
002E2 [12] 2777      396 v113   rti      ;User Vector 58
002E4 [12] 2777      397 v114   rti      ;User Vector 59
002E6 [12] 2777      398 v115   rti      ;User Vector 60
002E8 [12] 2777      399 v116   rti      ;User Vector 61
002EA [12] 2777      400 v117   rti      ;User Vector 62
002EC [12] 2777      401 v118   rti      ;User Vector 63
002EE [12] 2777      402 v119   rti      ;User Vector 64
002F0 [12] 2777      403 v120   rti      ;User Vector 65
002F2 [12] 2777      404 v121   rti      ;User Vector 66
002F4 [12] 2777      405 v122   rti      ;User Vector 67
002F6 [12] 2777      406 v123   rti      ;User Vector 68
002F8 [12] 2777      407 v124   rti      ;User Vector 69
002FA [12] 2777      408 v125   rti      ;User Vector 70
002FC [12] 2777      409 v126   rti      ;User Vector 71
002FE [12] 2777      410 v127   rti      ;User Vector 72
00300 [12] 2777      411 v128   rti      ;User Vector 73
00302 [12] 2777      412 v129   rti      ;User Vector 74
00304 [12] 2777      413 v130   rti      ;User Vector 75
00306 [12] 2777      414 v131   rti      ;User Vector 76
00308 [12] 2777      415 v132   rti      ;User Vector 77
0030A [12] 2777      416 v133   rti      ;User Vector 78
0030C [12] 2777      417 v134   rti      ;User Vector 79
0030E [12] 2777      418 v135   rti      ;User Vector 80
00310 [12] 2777      419 v136   rti      ;User Vector 81
00312 [12] 2777      420 v137   rti      ;User Vector 82
00314 [12] 2777      421 v138   rti      ;User Vector 83
00316 [12] 2777      422 v139   rti      ;User Vector 84
00318 [12] 2777      423 v140   rti      ;User Vector 85
0031A [12] 2777      424 v141   rti      ;User Vector 86
0031C [12] 2777      425 v142   rti      ;User Vector 87
0031E [12] 2777      426 v143   rti      ;User Vector 88
00320 [12] 2777      427 v144   rti      ;User Vector 89
00322 [12] 2777      428 v145   rti      ;User Vector 90
00324 [12] 2777      429 v146   rti      ;User Vector 91
00326 [12] 2777      430 v147   rti      ;User Vector 92
00328 [12] 2777      431 v148   rti      ;User Vector 93
0032A [12] 2777      432 v149   rti      ;User Vector 94
0032C [12] 2777      433 v150   rti      ;User Vector 95

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0032E [12] 2777      434 v151   rti      ;User Vector 96
00330 [12] 2777      435 v152   rti      ;User Vector 97
00332 [12] 2777      436 v153   rti      ;User Vector 98
00334 [12] 2777      437 v154   rti      ;User Vector 99
00336 [12] 2777      438 v155   rti      ;User Vector 100
00338 [12] 2777      439 v156   rti      ;User Vector 101
0033A [12] 2777      440 v157   rti      ;User Vector 102
0033C [12] 2777      441 v158   rti      ;User Vector 103
0033E [12] 2777      442 v159   rti      ;User Vector 104
00340 [12] 2777      443 v160   rti      ;User Vector 105
00342 [12] 2777      444 v161   rti      ;User Vector 106
00344 [12] 2777      445 v162   rti      ;User Vector 107
00346 [12] 2777      446 v163   rti      ;User Vector 108
00348 [12] 2777      447 v164   rti      ;User Vector 109
0034A [12] 2777      448 v165   rti      ;User Vector 110
0034C [12] 2777      449 v166   rti      ;User Vector 111
0034E [12] 2777      450 v167   rti      ;User Vector 112

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00350 [12] 2777      451 v168   rti      ;User Vector 113
00352 [12] 2777      452 v169   rti      ;User Vector 114
00354 [12] 2777      453 v170   rti      ;User Vector 115
00356 [12] 2777      454 v171   rti      ;User Vector 116
00358 [12] 2777      455 v172   rti      ;User Vector 117
0035A [12] 2777      456 v173   rti      ;User Vector 118
0035C [12] 2777      457 v174   rti      ;User Vector 119
0035E [12] 2777      458 v175   rti      ;User Vector 120
00360 [12] 2777      459 v176   rti      ;User Vector 121
00362 [12] 2777      460 v177   rti      ;User Vector 122
00364 [12] 2777      461 v178   rti      ;User Vector 123
00366 [12] 2777      462 v179   rti      ;User Vector 124
00368 [12] 2777      463 v180   rti      ;User Vector 125
0036A [12] 2777      464 v181   rti      ;User Vector 126
0036C [12] 2777      465 v182   rti      ;User Vector 127
0036E [12] 2777      466 v183   rti      ;User Vector 128
00370 [12] 2777      467 v184   rti      ;User Vector 129
00372 [12] 2777      468 v185   rti      ;User Vector 130
00374 [12] 2777      469 v186   rti      ;User Vector 131
00376 [12] 2777      470 v187   rti      ;User Vector 132
00378 [12] 2777      471 v188   rti      ;User Vector 133
0037A [12] 2777      472 v189   rti      ;User Vector 134
0037C [12] 2777      473 v190   rti      ;User Vector 135
0037E [12] 2777      474 v191   rti      ;User Vector 136
00380 [12] 2777      475 v192   rti      ;User Vector 137
00382 [12] 2777      476 v193   rti      ;User Vector 138
00384 [12] 2777      477 v194   rti      ;User Vector 139
00386 [12] 2777      478 v195   rti      ;User Vector 140
00388 [12] 2777      479 v196   rti      ;User Vector 141
0038A [12] 2777      480 v197   rti      ;User Vector 142
0038C [12] 2777      481 v198   rti      ;User Vector 143

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0038E	[12]	2777	482	v199	rti	;User Vector	144
00390	[12]	2777	483	v200	rti	;User Vector	145
00392	[12]	2777	484	v201	rti	;User Vector	146
00394	[12]	2777	485	v202	rti	;User Vector	147
00396	[12]	2777	486	v203	rti	;User Vector	148
00398	[12]	2777	487	v204	rti	;User Vector	149
0039A	[12]	2777	488	v205	rti	;User Vector	150
0039C	[12]	2777	489	v206	rti	;User Vector	151
0039E	[12]	2777	490	v207	rti	;User Vector	152
003A0	[12]	2777	491	v208	rti	;User Vector	153
003A2	[12]	2777	492	v209	rti	;User Vector	154
003A4	[12]	2777	493	v210	rti	;User Vector	155
003A6	[12]	2777	494	v211	rti	;User Vector	156
003A8	[12]	2777	495	v212	rti	;User Vector	157
003AA	[12]	2777	496	v213	rti	;User Vector	158
003AC	[12]	2777	497	v214	rti	;User Vector	159
003AE	[12]	2777	498	v215	rti	;User Vector	160
003B0	[12]	2777	499	v216	rti	;User Vector	161
003B2	[12]	2777	500	v217	rti	;User Vector	162
003B4	[12]	2777	501	v218	rti	;User Vector	163
003B6	[12]	2777	502	v219	rti	;User Vector	164
003B8	[12]	2777	503	v220	rti	;User Vector	165
003BA	[12]	2777	504	v221	rti	;User Vector	166
003BC	[12]	2777	505	v222	rti	;User Vector	167
003BE	[12]	2777	506	v223	rti	;User Vector	168
003C0	[12]	2777	507	v224	rti	;User Vector	169
003C2	[12]	2777	508	v225	rti	;User Vector	170

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003C4	[12]	2777	509	v226	rti	;User Vector	171
003C6	[12]	2777	510	v227	rti	;User Vector	172
003C8	[12]	2777	511	v228	rti	;User Vector	173
003CA	[12]	2777	512	v229	rti	;User Vector	174
003CC	[12]	2777	513	v230	rti	;User Vector	175
003CE	[12]	2777	514	v231	rti	;User Vector	176
003D0	[12]	2777	515	v232	rti	;User Vector	177
003D2	[12]	2777	516	v233	rti	;User Vector	178
003D4	[12]	2777	517	v234	rti	;User Vector	179
003D6	[12]	2777	518	v235	rti	;User Vector	180
003D8	[12]	2777	519	v236	rti	;User Vector	181
003DA	[12]	2777	520	v237	rti	;User Vector	182
003DC	[12]	2777	521	v238	rti	;User Vector	183
003DE	[12]	2777	522	v239	rti	;User Vector	184
003E0	[12]	2777	523	v240	rti	;User Vector	185
003E2	[12]	2777	524	v241	rti	;User Vector	186
003E4	[12]	2777	525	v242	rti	;User Vector	187
003E6	[12]	2777	526	v243	rti	;User Vector	188
003E8	[12]	2777	527	v244	rti	;User Vector	189
003EA	[12]	2777	528	v245	rti	;User Vector	190
003EC	[12]	2777	529	v246	rti	;User Vector	191

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003EE	[12]	2777	530	v247	rti	;User Vector 192
003F0	[12]	2777	531	v248	rti	;User Vector 193
003F2	[12]	2777	532	v249	rti	;User Vector 194
003F4	[12]	2777	533	v250	rti	;User Vector 195
003F6	[12]	2777	534	v251	rti	;User Vector 196
003F8	[12]	2777	535	v252	rti	;User Vector 197
003FA	[12]	2777	536	v253	rti	;User Vector 198
003FC	[12]	2777	537	v254	rti	;User Vector 199
003FE	[12]	2777	538	v255	rti	;User Vector 200
			539			
			540			

Assembly Source Code

The following is the assembly source code for the previous listing. This code can be cut and pasted into an assembler for use with a user program.

```

org $0000

dw    $0f00    ;Initial ZK, SK and PK
                ;Replace with correct user value
dw    $0200    ;Initial Program Counter
                ;Replace with correct user value
dw    $3ffc    ;Initial Stack Pointer
                ;Replace with correct user value
dw    $f000    ;Initial IZ Register
                ;Replace with correct user value
dw    v4       ;Breakpoint
dw    v5       ;Bus Error
dw    v6       ;SWI Software Interrupt
dw    v7       ;Illegal Instruction
dw    v8       ;Division By Zero
dw    v9       ;Unassigned, Reserved
dw    v10      ;Unassigned, Reserved
dw    v11      ;Unassigned, Reserved
dw    v12      ;Unassigned, Reserved
dw    v13      ;Unassigned, Reserved
dw    v14      ;Unassigned, Reserved
dw    v15      ;Uninitialized Interrupt
dw    v16      ;Unassigned
dw    v17      ;Level 1 Interrupt Autovector
dw    v18      ;Level 2 Interrupt Autovector
dw    v19      ;Level 3 Interrupt Autovector
dw    v20      ;Level 4 Interrupt Autovector
dw    v21      ;Level 5 Interrupt Autovector
dw    v22      ;Level 6 Interrupt Autovector
dw    v23      ;Level 7 Interrupt Autovector
dw    v24      ;Spurious Interrupt
dw    v25      ;Unassigned, Reserved
dw    v26      ;Unassigned, Reserved
dw    v27      ;Unassigned, Reserved
dw    v28      ;Unassigned, Reserved

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dw    v29    ;Unassigned, Reserved
dw    v30    ;Unassigned, Reserved
dw    v31    ;Unassigned, Reserved
dw    v32    ;Unassigned, Reserved
dw    v33    ;Unassigned, Reserved
dw    v34    ;Unassigned, Reserved
dw    v35    ;Unassigned, Reserved
dw    v36    ;Unassigned, Reserved
dw    v37    ;Unassigned, Reserved
dw    v38    ;Unassigned, Reserved
dw    v39    ;Unassigned, Reserved
dw    v40    ;Unassigned, Reserved
dw    v41    ;Unassigned, Reserved
dw    v42    ;Unassigned, Reserved
dw    v43    ;Unassigned, Reserved
dw    v44    ;Unassigned, Reserved
dw    v45    ;Unassigned, Reserved
dw    v46    ;Unassigned, Reserved
dw    v47    ;Unassigned, Reserved
dw    v48    ;Unassigned, Reserved
dw    v49    ;Unassigned, Reserved
dw    v50    ;Unassigned, Reserved
dw    v51    ;Unassigned, Reserved
dw    v52    ;Unassigned, Reserved
dw    v53    ;Unassigned, Reserved
dw    v54    ;Unassigned, Reserved
dw    v55    ;Unassigned, Reserved

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```

dw    v56    ;User Defined Vector 0
dw    v57    ;User Defined Vector 1
dw    v58    ;User Defined Vector 2
dw    v59    ;User Defined Vector 3
dw    v60    ;User Defined Vector 4
dw    v61    ;User Defined Vector 5
dw    v62    ;User Defined Vector 6
dw    v63    ;User Defined Vector 7
dw    v64    ;User Defined Vector 8
dw    v65    ;User Defined Vector 9
dw    v66    ;User Defined Vector 10
dw    v67    ;User Defined Vector 11
dw    v68    ;User Defined Vector 12
dw    v69    ;User Defined Vector 13
dw    v70    ;User Defined Vector 14
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dw    v81    ;User Defined Vector 26
dw    v82    ;User Defined Vector 27

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dw	v85	;User Defined Vector	30
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dw	v236	;User Defined Vector	181
dw	v237	;User Defined Vector	182
dw	v238	;User Defined Vector	183
dw	v239	;User Defined Vector	184
dw	v240	;User Defined Vector	185
dw	v241	;User Defined Vector	186
dw	v242	;User Defined Vector	187
dw	v243	;User Defined Vector	188
dw	v244	;User Defined Vector	189
dw	v245	;User Defined Vector	190
dw	v246	;User Defined Vector	191
dw	v247	;User Defined Vector	192
dw	v248	;User Defined Vector	193
dw	v249	;User Defined Vector	194
dw	v250	;User Defined Vector	195

```

dw    v251    ;User Defined Vector 196
dw    v252    ;User Defined Vector 197
dw    v253    ;User Defined Vector 198
dw    v254    ;User Defined Vector 199
dw    v255    ;User Defined Vector 200

org $0200    ;Location $200 is the first address
              ;after the exception vector table.
              ;The org statement could be anywhere
              ;in memory.

```

```

v0     fcb $00,$00    ;Reset: Initial ZK, SK and PK
v1     fcb $02,$00    ;Reset: Initial Program Counter
v2     fcb $3f,$fc    ;Reset: Initial Stack Pointer
v3     fcb $f0,$00    ;Reset: Initial IZ Register
              ;The values at v0, v1, v2 and v3 are
              ;never used. They are simply put here
              ;as place holders so that the label
              ;v4 will start at address $0008
v4     rti            ;Breakpoint
v5     rti            ;BERR
v6     rti            ;Software Interrupt
v7     rti            ;Illegal Instruction
v8     rti            ;Division by Zero
v9     rti            ;Unassigned
v10    rti            ;Unassigned
v11    rti            ;Unassigned
v12    rti            ;Unassigned
v13    rti            ;Unassigned
v14    rti            ;Unassigned
v15    rti            ;Uninitialized Interrupt
v16    rti            ;Unassigned
v17    rti            ;Level 1 Autovector
v18    rti            ;Level 2 Autovector
v19    rti            ;Level 3 Autovector
v20    rti            ;Level 4 Autovector
v21    rti            ;Level 5 Autovector
v22    rti            ;Level 6 Autovector
v23    rti            ;Level 7 Autovector
v24    rti            ;Spurious Interrupt
v25    rti            ;Unassigned, Reserved
v26    rti            ;Unassigned, Reserved
v27    rti            ;Unassigned, Reserved
v28    rti            ;Unassigned, Reserved
v29    rti            ;Unassigned, Reserved
v30    rti            ;Unassigned, Reserved
v31    rti            ;Unassigned, Reserved
v32    rti            ;Unassigned, Reserved
v33    rti            ;Unassigned, Reserved
v34    rti            ;Unassigned, Reserved
v35    rti            ;Unassigned, Reserved
v36    rti            ;Unassigned, Reserved

```

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```

v37      rti          ;Unassigned, Reserved
v38      rti          ;Unassigned, Reserved
v39      rti          ;Unassigned, Reserved
v40      rti          ;Unassigned, Reserved
v41      rti          ;Unassigned, Reserved
v42      rti          ;Unassigned, Reserved
v43      rti          ;Unassigned, Reserved
v44      rti          ;Unassigned, Reserved
v45      rti          ;Unassigned, Reserved
v46      rti          ;Unassigned, Reserved
v47      rti          ;Unassigned, Reserved
v48      rti          ;Unassigned, Reserved
v49      rti          ;Unassigned, Reserved
v50      rti          ;Unassigned, Reserved
v51      rti          ;Unassigned, Reserved
v52      rti          ;Unassigned, Reserved
v53      rti          ;Unassigned, Reserved
v54      rti          ;Unassigned, Reserved
v55      rti          ;Unassigned, Reserved
v56      rti          ;User Vector 0
v57      rti          ;User Vector 1
v58      rti          ;User Vector 2
v59      rti          ;User Vector 3
v60      rti          ;User Vector 4
v61      rti          ;User Vector 5
v62      rti          ;User Vector 6
v63      rti          ;User Vector 7
v64      rti          ;User Vector 8
v65      rti          ;User Vector 9
v66      rti          ;User Vector 10
v67      rti          ;User Vector 12
v68      rti          ;User Vector 13
v69      rti          ;User Vector 14
v70      rti          ;User Vector 15
v71      rti          ;User Vector 16
v72      rti          ;User Vector 17
v73      rti          ;User Vector 18
v74      rti          ;User Vector 19
v75      rti          ;User Vector 20
v76      rti          ;User Vector 21
v77      rti          ;User Vector 22
v78      rti          ;User Vector 23
v79      rti          ;User Vector 24
v80      rti          ;User Vector 25
v81      rti          ;User Vector 26
v82      rti          ;User Vector 27
v83      rti          ;User Vector 28
v84      rti          ;User Vector 29
v85      rti          ;User Vector 30
v86      rti          ;User Vector 31
v87      rti          ;User Vector 32
v88      rti          ;User Vector 33
v89      rti          ;User Vector 34
v90      rti          ;User Vector 35
v91      rti          ;User Vector 36
v92      rti          ;User Vector 37
    
```

v93	rti	;User Vector	38
v94	rti	;User Vector	39
v95	rti	;User Vector	40
v96	rti	;User Vector	41
v97	rti	;User Vector	42
v98	rti	;User Vector	43
v99	rti	;User Vector	44
v100	rti	;User Vector	45
v101	rti	;User Vector	46
v102	rti	;User Vector	47
v103	rti	;User Vector	48
v104	rti	;User Vector	49
v105	rti	;User Vector	50
v106	rti	;User Vector	51
v107	rti	;User Vector	52
v108	rti	;User Vector	53
v109	rti	;User Vector	54
v110	rti	;User Vector	55
v111	rti	;User Vector	56
v112	rti	;User Vector	57
v113	rti	;User Vector	58
v114	rti	;User Vector	59
v115	rti	;User Vector	60
v116	rti	;User Vector	61
v117	rti	;User Vector	62
v118	rti	;User Vector	63
v119	rti	;User Vector	64
v120	rti	;User Vector	65
v121	rti	;User Vector	66
v122	rti	;User Vector	67
v123	rti	;User Vector	68
v124	rti	;User Vector	69
v125	rti	;User Vector	70
v126	rti	;User Vector	71
v127	rti	;User Vector	72
v128	rti	;User Vector	73
v129	rti	;User Vector	74
v130	rti	;User Vector	75
v131	rti	;User Vector	76
v132	rti	;User Vector	77
v133	rti	;User Vector	78
v134	rti	;User Vector	79
v135	rti	;User Vector	80
v136	rti	;User Vector	81
v137	rti	;User Vector	82
v138	rti	;User Vector	83
v139	rti	;User Vector	84
v140	rti	;User Vector	85
v141	rti	;User Vector	86
v142	rti	;User Vector	87
v143	rti	;User Vector	88
v144	rti	;User Vector	89
v145	rti	;User Vector	90
v146	rti	;User Vector	91
v147	rti	;User Vector	92
v148	rti	;User Vector	93


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v149	rti	;User Vector	94
v150	rti	;User Vector	95
v151	rti	;User Vector	96
v152	rti	;User Vector	97
v153	rti	;User Vector	98
v154	rti	;User Vector	99
v155	rti	;User Vector	100
v156	rti	;User Vector	101
v157	rti	;User Vector	102
v158	rti	;User Vector	103
v159	rti	;User Vector	104
v160	rti	;User Vector	105
v161	rti	;User Vector	106
v162	rti	;User Vector	107
v163	rti	;User Vector	108
v164	rti	;User Vector	109
v165	rti	;User Vector	110
v166	rti	;User Vector	111
v167	rti	;User Vector	112
v168	rti	;User Vector	113
v169	rti	;User Vector	114
v170	rti	;User Vector	115
v171	rti	;User Vector	116
v172	rti	;User Vector	117
v173	rti	;User Vector	118
v174	rti	;User Vector	119
v175	rti	;User Vector	120
v176	rti	;User Vector	121
v177	rti	;User Vector	122
v178	rti	;User Vector	123
v179	rti	;User Vector	124
v180	rti	;User Vector	125
v181	rti	;User Vector	126
v182	rti	;User Vector	127
v183	rti	;User Vector	128
v184	rti	;User Vector	129
v185	rti	;User Vector	130
v186	rti	;User Vector	131
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v195	rti	;User Vector	140
v196	rti	;User Vector	141
v197	rti	;User Vector	142
v198	rti	;User Vector	143
v199	rti	;User Vector	144
v200	rti	;User Vector	145
v201	rti	;User Vector	146
v202	rti	;User Vector	147
v203	rti	;User Vector	148
v204	rti	;User Vector	149

v205	rti	;User Vector	150
v206	rti	;User Vector	151
v207	rti	;User Vector	152
v208	rti	;User Vector	153
v209	rti	;User Vector	154
v210	rti	;User Vector	155
v211	rti	;User Vector	156
v212	rti	;User Vector	157
v213	rti	;User Vector	158
v214	rti	;User Vector	159
v215	rti	;User Vector	160
v216	rti	;User Vector	161
v217	rti	;User Vector	162
v218	rti	;User Vector	163
v219	rti	;User Vector	164
v220	rti	;User Vector	165
v221	rti	;User Vector	166
v222	rti	;User Vector	167
v223	rti	;User Vector	168
v224	rti	;User Vector	169
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v227	rti	;User Vector	172
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v231	rti	;User Vector	176
v232	rti	;User Vector	177
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v236	rti	;User Vector	181
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v251	rti	;User Vector	196
v252	rti	;User Vector	197
v253	rti	;User Vector	198
v254	rti	;User Vector	199
v255	rti	;User Vector	200

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