

5 X

1

The CLONE
IBM PC Compatibility Support
for the NCR Decision Mate V

David A. Roger
1840 Donalor Dr.
Escondido, CA 92027
~~9001~~ (619) 746-0698

001 619 259
4306
699 481 4004

IBM PC is a registered trademark of International Business Machines Corp.

Decision Mate V registered trademark of NCR Corp.

Copyright © 1986 D.A. Roger

1

- FEATURES
- 2
- o Execution Parameters:
 - ON/OFF Switch
 - Function/Directional Keys Assignment
 - Keyboard Layout
 - Usage Message
 - o Interrupt Support for:
 - Print Screen
 - Video Services
 - Equipment-List
 - Cassette (inop return)
 - Keyboard Services (with scan codes)
 - Printer Services - Parallel & Serial
 - o DOS/BASIC level PC key assignments
 - o Print Screen Key
 - o Only 3K Memory Resident Program

INT 05h
INT 10h
INT 11h
INT 15h
INT 16h
INT 17h

Copyright © 1986 D.A. Roger

2

INTRODUCTION

3

The CLONE provides a subset level of compatibility with an IBM & Compatible PC's (PC) ROM BIOS services relating to Video, Keyboard, Printer I/O and other functions.

The Video Services are implemented via Interrupt 10 hex and are performed using the NEC 7220 Graphic Chip within the Decision Mate V (DMV). Not all service functions have been implemented; refer to the VIDEO SERVICES for specific details.

The Keyboard Services of the DMV, via Interrupt 16 hex, are enhanced to support PC scan code return values. A revised keyboard mapping, optionally installed by the CLONE, provides full Functional/Directional keys simulation at the DOS/BASIC levels. In addition, a PrtSc key that provides a CRT Screen dump to the printer is simulated at both the Keyboard Service and DOS level using the Shift '*' key on the numeric key pad. Not all PC keys are available; specifically, the Alt alpha/numeric keys are not emulated.

The Printer Services are implemented via Interrupt 17 hex and support the K210 Centronics-Interface and the K212/K801 Serial-Interface Modules. The normal PC implementation supports only a Parallel interface as LPTx; the CLONE simulates the parallel interface for the K212/K801, thereby needing no changes to programs requiring parallel printer usage.

The functions of Equipment Check (Interrupt 11 hex) and Cassette (Interrupt 15 hex) are implemented to return simulated status values.

The PrtSc key is implemented via the addition of Interrupt 05 hex, Print Screen Service.

IBM is a registered trademark of International Business Machines, Corp.

DMV is a registered trademark of NCR Corp.

Copyright © 1986 D.A. Roger

VIDEO SERVICES

4

- o Set Video Mode AH = 00
 - Perform Clear Screen only
- o Set Cursor Size AH = 011
 - Support Cursor display ON/OFF
 - Sizes for raster lines 0 - 7
- o Set Cursor Position AH = 021
 - Within Page 0 only
- o Read Cursor Position AH = 031
- o Scroll Window UP AH = 06h
- o Scroll Window DOWN AH = 07h
- o Read Character and Attribute AH = 08h
- o Write Character and Attribute AH = 09h
- o Write Character AH = 0Ah
- o Write Character as TTY AH = 0Eh
- o Read Video Mode AH = 0Fh
 - 80x25 black and white text; value 02
 - or-
 - 80x25 Color text; value 03

The others services and video paging have yet to be implemented.

Copyright © 1986 D.A. Roger

4

- o WORDPERFECT 4.1 & 4.2; SSI Software, Inc.
- o WORDSTAR — Release 4; MicroPro Int. Corp.
(except WORD FINDER; Microlytics, Inc.)
- o NORTON UTILITIES 3.10; Peter Norton Computing, Inc.
— NU, TS, etc.
- o SIDEWAYS 2.0 & 3.0; Funk Software, Inc.
- o XTREE 2.00; Executive System, Inc.
- o PRINT MASTER; Unison World, Inc.
(non-graphic mode only)
- o CED — DOS Command Editor 1.0; C. J. Dunford

The general compatibility of a program written for the PC and its successful execution under the CLONE is affected greatly by the use and/or access of data via direct port level I/O. The various adapter boards and support circuits of the PC may be addressed via direct port I/O. This practice is normally used for status verification and/or special PC feature implementation. The assignment of the port addresses varies even between the PC models and are much different and/or non-existent in the DMV.

The conflict of address assignments and usage between the DMV and the PC cause different failure indications, depending on the DMV hardware interface configuration. Known conflicts are the DMV and the PC differences in programs using sound and interrupt controller programming. These types of programs may cause the printer to slew continuously or to hang the machine. The most common symptom is the latter.

For programs which allow configuration options, try turning off sound. For video options, try specifying ones that have snow or flicker and, if available, use a ROM BIOS interface.

Programs which use only ROM BIOS Video Services, Interrupt 10 hex, for output to the CRT and which do not use Graphic Mode operations are functional under the CLONE.

Programs wishing to obtain maximum performance on a PC have gone to using direct movement of display data to the video RAM. The video RAM on the DMV is not directly accessible, so there is no simulation. Programs that use this technique to avoid 'flicker' or 'snow' on the CRT directly access the video controller status port. A check is made for the presence of bit 0 or 3 to be on, which indicates that access to video RAM at that time will not cause interference.

The following is the assembler code normally used for this test:

the dx register will be loaded with 03DA hex

```
st_ck:  in  al, dx      EC    ;hex object
        test al, 01h   A8 01
        jnz st_ck      75 FB
```

As you can see from the above code example, it is an endless loop waiting for bit 0 to come on. When this type of code is executed on the DMV, the system will be hung and the only recourse is the reset the machine.

Using the DEBUG command, a search can be made of the test program looking for the above binary code sequence. The above specific example has been found to present in several programs.

An example DEBUG search would be:

s 0 xxxx EC A8 01 xxxx = program size

The PC to DMV key mapping is the same with the exception of:

- o Alternate F01 - F10 mapped to Shift F11 - F20
- o Special Keys

- Shift TAB	- F15	
- END	- F16	Cntl END - Cntl F1
- INS	- F17	
- PgDn	- F18	Cntl PgDn - Cntl F1
- PgUp	- F19	Cntl PgUp - Cntl F1
- BREAK	- F20	
- DEL	- CLR key	
- o Numeric Pad

- PrtSc	- Shift '*'	
- Shift/Cntl Numbers equate to PC Directional Keys		
- o DOS Command Line Edit Support

- Copy 1 char	- F11	
- Copy to	- F12	
- Dup	- F13	
- Skip to	- F14	

9

Programs written for the PC normally use ROM BIOS Keyboard Services, Interrupt 16 hex, for access to the keyboard. The two service functions of reading characters, AH = 00 - read character; AH = 01 - Character ready, return in the AH register (auxiliary byte) the assigned scan code for the specific key depressed and in the AL register (main byte) is its actual assigned ASCII code hex value. The group of special keys on the PC have a fixed ASCII code hex value of zero (00) and the scan code (auxiliary byte) is used to identify which specific special key was depressed.

When using DOS/BASIC level keyboard access routines, the return values are somewhat different. These routines return a single character equal to the ASCII code hex value for the key. For the special keys, a return of zero (00) indicates a second character is available to identify the specific key depressed.

The CLONE support both of the above access methods. The optional activate parameter of 'F' will install the DOS/BASIC level key code values using the DMV keyboard programming escape sequences. The Interrupt 16 keyboard return values are unaffected by this parameter and always return appropriate AH/AL values.

Normal first-time execution of the CLONE need not specify DOS/BASIC level activate parameter. A subsequent reactivation of the CLONE with the 'F' parameter option will reprogram the DMV keyboard. The state of all DMV programmable keys will be saved before the CLONE starts keyboard re-programming. Upon de-activation of the CLONE a restore the original keys values will be made. Not all programmable keys are affected, refer to the keyboard layout screen for the specific keys.

For DOS Command Line Edit support four DMV function keys are optionally programmed ('F' parameter option) for your convenience:

- | | |
|------------|-----|
| 1. Copy 1 | F11 |
| 2. Copy to | F12 |
| 3. Copy | F13 |
| 4. Skip to | F14 |

10

1. First-time Usage message, CLONE execution w/no parameters.

```

CLONE - Ver R.XX - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED

Status: The CLONE is NOT Resident

Printer = ?      Licensed to: xxxxxxxxxxxxxxxxxxxx      DOS 2.77

Execution: CLONE ( [ F 1 ] ) or (-)

  -" or "-" ) Activate (if followed by):
    -F = Install Function/Directional Keys
    -L = List Keyboard Layout

  "-- or "-/ ) De-Activate

*letters may be either case
  
```

R.XX - CLONE Version and Point Release number.
 Printer = ? - Printer type: P for Parallel, S for Serial.
 xxxxxx's - Name of Licensee and Serial Number.
 DOS 2.77 - DOS Version number of 00 or 11.

o Execution Parameters:

CLONE { + [F L] } or { - }

Activate: '+' or '='

Optional: 'F' for Install Function/Directional Keys
'L' for List of Keyboard Layout Display

De-Activate: '-' or '/'

Letters may be either case.

o PrtSc Key:

- Shift Numeric Pad '*' is the PrtSc Key

If the printer is inoperative, a flashing "P" will appear in the upper right corner of screen.

o First time usage type "CLONE +FL", New Line;
then depress the PrtSc Key to capture keyboard layout.

1. Normal initialization/installation message.

CLONE - Ver R.XX - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED			
Status: The CLONE is fully Initialized, and is Active.			
Printer = 7	Licensed to: xxxxxxxxxxxxxxxxxxxx		DOS 2.??

2. Momentary message while defining DOS Level Keyboard.

CLONE - Ver R.XX - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED			
Status: Defining DOS Level Keyboard ...			
Printer = 7	Licensed to: xxxxxxxxxxxxxxxxxxxx		DOS 2.??

R.XX - CLONE Version and Point Release number.
Printer = 7 - Printer type; P for Parallel, S for Serial.
xxxxxx's - Name of Licensee and Serial Number.
DOS 2.?? - DOS Version number of 00 or 11.

13

1. CLONE - Active.

CLONE - Ver R.XX - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED			
Status: The CLONE is fully Initialized, and is Active!			
Printer = ?	Licensed to: xxxxxxxxxxxxxxxxxxxx	DOS 2.??	

2. CLONE - NOT Active.

CLONE - Ver R.XX - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED			
Status: The CLONE is fully Initialized, but is NOT Active!			
Printer = ?	Licensed to: xxxxxxxxxxxxxxxxxxxx	DOS 2.??	

R.XX - CLONE Version and Polat Release number.
 Printer = ? - Printer type: P for Parallel, S for Serial.
 xxxxxx's - Name of Licensee and Serial Number.
 DOS 2.?? - DOS Version number of 00 or 11.

Copyright © 1986 D.A.Roger

SCREEN DISPLAYS

Norna

48
14

3. CLONE Re-Activated complete.

CLONE - Ver R.XX - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED			
Status: The CLONE has been Re-Activated.			
Printer = ?	Licensed to: xxxxxxxxxxxxxxxxxxxx	DOS 2.??	

4. CLONE De-Activation complete.

CLONE - Ver R.XX - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED			
Status: The CLONE has been De-Activated.			
Printer = ?	Licensed to: xxxxxxxxxxxxxxxxxxxx	DOS 2.??	

R.XX - CLONE Version and Polat Release number.
 Printer = ? - Printer type: P for Parallel, S for Serial.
 xxxxxx's - Name of Licensee and Serial Number.
 DOS 2.?? - DOS Version number of 00 or 11.

Copyright © 1986 D.A.Roger

7

Keyboard

2. Keyboard Layout - DOS 2.11

14
15

CLONE - Ver R.XX - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED									
Licensed to: xxxxxxxxxxxxxxxxxxxx									
*** All DMV Keys are the same with the exception of: ***									
Ctrl	1	2	3	4	5	6	7	8	9
Shift	Alt	F1	Alt	F2	Alt	F3	Alt	F4	Alt
Shift	Alt	F5	Alt	F6	Alt	F7	Alt	F8	Alt
Shift	Alt	F9	Alt	F10	Alt	F11	Alt	F12	Alt
ICpy	1	ICpy	to	Dup	ISkp	to	ISft	Alt	1
Key	F11	F12	F13	F14	F15	F16	F17	F18	F19
Key	F20	F21	F22	F23	F24	F25	F26	F27	F28
Key	F29	F30	F31	F32	F33	F34	F35	F36	F37
Key	F38	F39	F40	F41	F42	F43	F44	F45	F46
Key	F47	F48	F49	F50	F51	F52	F53	F54	F55
Key	F56	F57	F58	F59	F60	F61	F62	F63	F64
Key	F65	F66	F67	F68	F69	F70	F71	F72	F73
Key	F74	F75	F76	F77	F78	F79	F80	F81	F82
Key	F83	F84	F85	F86	F87	F88	F89	F90	F91
Key	F92	F93	F94	F95	F96	F97	F98	F99	F100
Key	F101	F102	F103	F104	F105	F106	F107	F108	F109
Key	F110	F111	F112	F113	F114	F115	F116	F117	F118
Key	F119	F120	F121	F122	F123	F124	F125	F126	F127
Key	F128	F129	F130	F131	F132	F133	F134	F135	F136
Key	F137	F138	F139	F140	F141	F142	F143	F144	F145
Key	F146	F147	F148	F149	F150	F151	F152	F153	F154
Key	F155	F156	F157	F158	F159	F160	F161	F162	F163
Key	F164	F165	F166	F167	F168	F169	F170	F171	F172
Key	F173	F174	F175	F176	F177	F178	F179	F180	F181
Key	F182	F183	F184	F185	F186	F187	F188	F189	F190
Key	F191	F192	F193	F194	F195	F196	F197	F198	F199
Key	F200	F201	F202	F203	F204	F205	F206	F207	F208
Key	F209	F210	F211	F212	F213	F214	F215	F216	F217
Key	F218	F219	F220	F221	F222	F223	F224	F225	F226
Key	F227	F228	F229	F230	F231	F232	F233	F234	F235
Key	F236	F237	F238	F239	F240	F241	F242	F243	F244
Key	F245	F246	F247	F248	F249	F250	F251	F252	F253
Key	F254	F255	F256	F257	F258	F259	F260	F261	F262
Key	F263	F264	F265	F266	F267	F268	F269	F270	F271
Key	F272	F273	F274	F275	F276	F277	F278	F279	F280
Key	F281	F282	F283	F284	F285	F286	F287	F288	F289
Key	F290	F291	F292	F293	F294	F295	F296	F297	F298
Key	F299	F300	F301	F302	F303	F304	F305	F306	F307
Key	F308	F309	F310	F311	F312	F313	F314	F315	F316
Key	F317	F318	F319	F320	F321	F322	F323	F324	F325
Key	F326	F327	F328	F329	F330	F331	F332	F333	F334
Key	F335	F336	F337	F338	F339	F340	F341	F342	F343
Key	F344	F345	F346	F347	F348	F349	F350	F351	F352
Key	F353	F354	F355	F356	F357	F358	F359	F360	F361
Key	F362	F363	F364	F365	F366	F367	F368	F369	F370
Key	F371	F372	F373	F374	F375	F376	F377	F378	F379
Key	F380	F381	F382	F383	F384	F385	F386	F387	F388
Key	F389	F390	F391	F392	F393	F394	F395	F396	F397
Key	F398	F399	F400	F401	F402	F403	F404	F405	F406
Key	F407	F408	F409	F410	F411	F412	F413	F414	F415
Key	F416	F417	F418	F419	F420	F421	F422	F423	F424
Key	F425	F426	F427	F428	F429	F430	F431	F432	F433
Key	F434	F435	F436	F437	F438	F439	F440	F441	F442
Key	F443	F444	F445	F446	F447	F448	F449	F450	F451
Key	F452	F453	F454	F455	F456	F457	F458	F459	F460
Key	F461	F462	F463	F464	F465	F466	F467	F468	F469
Key	F470	F471	F472	F473	F474	F475	F476	F477	F478
Key	F479	F480	F481	F482	F483	F484	F485	F486	F487
Key	F488	F489	F490	F491	F492	F493	F494	F495	F496
Key	F497	F498	F499	F500	F501	F502	F503	F504	F505
Key	F506	F507	F508	F509	F510	F511	F512	F513	F514
Key	F515	F516	F517	F518	F519	F520	F521	F522	F523
Key	F524	F525	F526	F527	F528	F529	F530	F531	F532
Key	F533	F534	F535	F536	F537	F538	F539	F540	F541
Key	F542	F543	F544	F545	F546	F547	F548	F549	F550
Key	F551	F552	F553	F554	F555	F556	F557	F558	F559
Key	F560	F561	F562	F563	F564	F565	F566	F567	F568
Key	F569	F570	F571	F572	F573	F574	F575	F576	F577
Key	F578	F579	F580	F581	F582	F583	F584	F585	F586
Key	F587	F588	F589	F590	F591	F592	F593	F594	F595
Key	F596	F597	F598	F599	F600	F601	F602	F603	F604
Key	F605	F606	F607	F608	F609	F610	F611	F612	F613
Key	F614	F615	F616	F617	F618	F619	F620	F621	F622
Key	F623	F624	F625	F626	F627	F628	F629	F630	F631
Key	F632	F633	F634	F635	F636	F637	F638	F639	F640
Key	F641	F642	F643	F644	F645	F646	F647	F648	F649
Key	F650	F651	F652	F653	F654	F655	F656	F657	F658
Key	F659	F660	F661	F662	F663	F664	F665	F666	F667
Key	F668	F669	F670	F671	F672	F673	F674	F675	F676
Key	F677	F678	F679	F680	F681	F682	F683	F684	F685
Key	F686	F687	F688	F689	F690	F691	F692	F693	F694
Key	F695	F696	F697	F698	F699	F700	F701	F702	F703
Key	F704	F705	F706	F707	F708	F709	F710	F711	F712
Key	F713	F714	F715	F716	F717	F718	F719	F720	F721
Key	F722	F723	F724	F725	F726	F727	F728	F729	F730
Key	F731	F732	F733	F734	F735	F736	F737	F738	F739
Key	F740	F741	F742	F743	F744	F745	F746	F747	F748
Key	F749	F750	F751	F752	F753	F754	F755	F756	F757
Key	F758	F759	F760	F761	F762	F763	F764	F765	F766
Key	F767	F768	F769	F770	F771	F772	F773	F774	F775
Key	F776	F777	F778	F779	F780	F781	F782	F783	F784
Key	F785	F786	F787	F788	F789	F790	F791	F792	F793
Key	F794	F795	F796	F797	F798	F799	F800	F801	F802
Key	F803	F804	F805	F806	F807	F808	F809	F810	F811
Key	F812	F813	F814	F815	F816	F817	F818	F819	F820
Key	F821	F822	F823	F824	F825	F826	F827	F828	F829
Key	F830	F831	F832	F833	F834	F835	F836	F837	F838
Key	F839	F840	F841	F842	F843	F844	F845	F846	F847
Key	F848	F849	F850	F851	F852	F853	F854	F855	F856
Key	F857	F858	F859	F860	F861	F862	F863	F864	F865
Key	F866	F867	F868	F869	F870	F871	F872	F873	F874
Key	F875	F876	F877	F878	F879	F880	F881	F882	F883
Key	F884	F885	F886	F887	F888	F889	F890	F891	F892
Key	F893	F894	F895	F896	F897	F898	F899	F900	F901
Key	F902	F903	F904	F905	F906	F907	F908	F909	F910
Key	F911	F912	F913	F914	F915	F916	F917	F918	F919
Key	F920	F921	F922	F923	F924	F925	F926	F927	F928
Key	F929	F930	F931	F932	F933	F934	F935	F936	F937
Key	F938	F939	F940	F941	F942	F943	F944	F945	F946
Key	F947	F948	F949	F950	F951	F952	F953	F954	F955
Key	F956	F957	F958	F959	F960	F961	F962	F963	F964
Key	F965	F966	F967	F968	F969	F970	F971	F972	F973
Key	F974	F975	F976	F977	F978	F979	F980	F981	F982
Key	F983	F984	F985	F986	F987	F988	F989	F990	F991
Key	F992	F993	F994	F995	F996	F997	F998	F999	F1000
Key	F1001	F1002	F1003	F1004	F1005	F1006	F1007	F1008	F1009
Key	F1010	F1011	F1012	F1013	F1014	F1015	F1016	F1017	F1018
Key	F1019	F1020	F1021	F1022	F1023	F1024	F1025	F1026	F1027
Key	F1028	F1029	F1030	F1031	F1032	F1033	F1034	F1035	F1036
Key	F1037	F1038	F1039	F1040	F1041	F1042	F1043	F1044	F1045
Key	F1046	F1047	F1048	F1049	F1050	F1051	F1052	F1053	F1054
Key	F1055	F1056	F1057	F1058	F1059	F1060	F1061	F1062	F1063
Key	F1064	F1065	F1066	F1067	F1068	F1069	F1070	F1071	F1072
Key	F1073	F1074	F1075	F1076	F1077	F1078	F1079	F1080	F1081
Key	F1082	F1083	F1084	F1085	F1086	F1087	F1088	F1089	F1090
Key	F1091	F1092	F1093	F1094	F1095	F1096	F1097	F1098	F1099
Key	F1100	F1101	F1102	F1103	F1104	F1105	F1106	F1107	F1108
Key	F1109	F1110	F1111	F1112	F1113	F1114	F1115	F1116	F1117
Key	F111								

17

4. Initialization Error - incorrect DOS memory values.

18

5. Non-supported DOS version error.

The CLONE requires DOS 2.00 or 2.11

XXX - CLONE Version and Point Release number.
 Printer = ? - Printer type: P for Parallel, S for Serial.
 XXXXXX's - Name of Licensee and Serial Number.
 DOS 2.11 - DOS Version number of 00 or 11.

19

The CLONE
IBM PC Compatibility Support
for the NCR Decision Mate V

PROGRAMMERS
Reference Guide

David A. Roger
1840 Donalor Dr.
Escondido, CA 92027
(619) 746-0698

IBM PC is a registered trademark of International Business Machines, Corp.

Decision Mate V registered trademark of NCR Corp.

Copyright © 1986 D.A. Roger

Print Screen

Video Services:

Set Video Mode
Set Cursor Size
Set Cursor Position
Read Cursor Position
Scroll Window UP
Scroll Window DOWN
Read Character and Attribute
Write Character and Attribute
Write Character
Write Character via TTY
Read Video Mode

Equipment - List Service

Cassette Tape Service

Keyboard Services:

Read Character
Read Character
Shift/Cntl/Alt Status

Printer Services:

Send byte to printer
Send byte to printer
Initialize printer
Get printer status

Character Set/Translation Charts

20

Interrupt 05h

Interrupt 10h

AH = 00h
AH = 01h
AH = 02h
AH = 03h
AH = 06h
AH = 07h
AH = 08h
AH = 09h
AH = 0Ah
AH = 0Eh
AH = 0Fh

Interrupt 11h

Interrupt 15h

Interrupt 16h

AH = 00h
AH = 01h
AH = 02h

Interrupt 17h

K210 AH = 00h
K212/K801 AH = 00h
AH = 01h
AH = 02h

COPYRIGHT NOTICE

The CLONE software product and manuals are copyright 1986 by D.A. Roger. All rights are reserved, worldwide. Unauthorized use, duplication or distribution is strictly prohibited by federal law.

14

Copyright © 1986 D.A. Roger

Print Screen

none

Input Registers:

none

Return Registers:

none

This service is used to print the video screen (text mode) to the printer. It can be use with programs for output of the current display screen by coding of the assembler 'INT' command with an operand of 05 hex.

The CLONE simulated PrtSc key, numeric pad shift '**', invokes this service.

Set Video Mode

AIH = 00

Input Registers:

AL = video mode settings in hex:

02 - 80x25 black/white text

03 - 80x25 color text

Return Registers:

none

This service is normally used to set the various video display modes. A by-product of this service is the clearing of the screen when changing modes.

Under the CLONE's control only a clearing of the screen will occur. The above AL register values are shown only as a reminder of the supported modes available on the DMV. The specific mode is determined by a flag set by the operating system software at boot time on the DMV. This flag reflects only a Color or a Monochrome type CRT installed and has nor relationship to PC modes.

Set Cursor Size

AH = 01

Input Registers:

CH = start raster line number
CL = ending raster line number

Bit 5 of the CH register determines:

one = cursor is not displayed, turned off
zero = cursor is displayed, turned on

Return Registers:

none

This service is used to control the cursor display. The CH/CL registers specify the raster line values ranging from 0 (zero), being the top most line number, to 7 (seven), being the bottom line number. The range reflects the 8x8 character matrix of the IBM PC. Normal value setting are CH = 06, CL = 07; resulting in a double line cursor display.

The state of bit 5 in the CH register is used to control the overall display of the cursor. If the bit is on, value 1, the display of the cursor will be turned OFF. If the bit is off, value 0, the display of the cursor will be turned ON.

Set Cursor Position

AH = 02

Input Registers:

BH = video page value
DH = Row value
DL = Column value

Return Registers:

none

This service is used to position the cursor within the video display page. The video page or text screen has a matrix of 25 Rows by 80 Columns. The upper left corner is assigned Row 0, Column 0. DH/DL registers specify the point of placement of the cursor within the screen matrix.

The BH register value on a compatible selects a specific target page, but the CLONE currently supports page ZERO only.

Read Cursor Position

link 90
AH = 03

Input Registers:

BH = video page value

25

Return Registers:

CH = start raster line number
CL = ending raster line number
DH = Row value
DL = Column value

This service is used to obtain the current position of the cursor within the video display page. The video page or text screen has a matrix of 25 Rows by 80 Columns. The upper left corner is assigned Row 0, Column 0.

The CH/CL registers return values specify the cursor size information, they are currently preset to a return with values of 07 hex each. The DH/DL registers return values specify the current position of the cursor within the screen matrix.

The BH register value on a compatible selects a specific target page, but the CLONE currently supports page ZERO only.

18

Scroll Window UP

AH = 06

Input Registers:

AL = number of lines to scroll up
BH = attribute to fill blank line
CH = top Row value
CL = left Column value
DH = bottom Row value
DL = right Column value

4
X
4
X

26

Return Registers:

None

This service is used to scroll a window from bottom to top in an upward direction as specified by the top/left corner and bottom/right matrix coordinate combinations: CH/CL - DH/DL.

The AL register value specifies the number of blank lines to scroll within the window. If the AL register value is ZERO or greater than the window size the entire window is cleared using the fill attribute.

The BH register value specifies the fill color attribute for blank lines.

Scroll Window DOWN

AH = 07

27

Input Registers:

AL = number of lines to scroll up
 BH = attribute to fill blank line
 CH = top Row value
 CL = left Column value
 DH = bottom Row value
 DL = right Column value

Return Registers:

None

This service is used to scroll a window from top to bottom in an downward direction as specified by the top/left corner and bottom/right matrix coordinate combinations: CH/CL - DH/DL.

The AL register value specifies the number of blank lines to scroll within the window. If the AL register value is ZERO or greater than the window size the entire window is cleared using the fill attribute.

The BH register value specifies the fill color attribute for blank lines.

19

Read Character and Attribute

AH = 08

28

Input Registers:

BH = video page value.

Return Registers:

AH = character
 AL = display attribute

This service is used to read the current character and its video display attribute at the current cursor position.

The AH register return value will be the actual DMV CRT display character from video memory. This character may be a result of a conversion to a DMV displayable character and not the original PC display character. The AL register return value, display attribute, will be the converted PC equivalent of the characters' DMV attribute value.

The BH register value on a compatible selects a specific target page, but the CLONE currently supports page ZERO only. dn

Write Character and Attribute

Write Character
AH = 09

Input Registers:

AL = display character
BH = video page
BL = attribute
CX = repeat counter

Return Registers:

None

This service is used to write a character with a video display attribute at the current cursor position.

The AL register value, display character, will be translated to an available DMV displayable character. The BL register value will be converted to an equivalent display attribute appropriate to the DMV.

The BH register value on a compatible selects one of 4 color pages, but the CLONE currently only supports page ZERO.

The CX register value specifies the number of repeats of the character with its attribute to be displayed. Line wrap will occur.

The current cursor position is not incremented by the service.

Write Character

Write Character
AH = 0A

Input Registers:

AL = display character
BH = video page
CX = repeat counter

Return Registers:

None

This service is used to write a character using the last specified video display attribute at the current cursor position.

The AL register value, display character, will be translated to an available DMV displayable character.

The BH register value on a compatible selects one of 4 color pages, but the CLONE currently only supports page ZERO.

The CX register value specifies the number of repeats of the character to be displayed. Line wrap will occur.

The current cursor position is not incremented by the service.

Write Character via TTY

AH = 0E

Input Registers:

AL = display character
BH = video page

Return Registers:

None

This service is used to write a character using the TTY as the output device. The effect of this service is that the character can be redirected and the cursor position is incremented.

The AL register value, display character, will be converted to a displayable character available on the DMV.

The BH register value on a Compatible selects a specific target page, but the CLONE currently supports page ZERO only.

22

Read Video Mode

AH = 0F

Input Registers:

None

Return Registers:

AH = display width (fixed - 80 characters)
AL = video mode return settings for:

Monochrome CRT: 02 - 80x25 black and white text display
Color CRT: 03 - 80x25 color text display

This service is normally used to read the current setting of the video mode.

The CLONE return only two values matching the configuration of the DMV for a Color CRT or Monochrome CRT.

Interrupt 11 hex

Equipment - List

none

Input Registers:

none

Return Registers:

AX = equipment flags:

bits	description	set to
15,14	# of Printers	01
13	Serial Printer?	0 (1=serial)
12	Game Adapter	0 (1=installed)
11,10,9	# of RS-232c Ports	001 (1 port)
8	DMA Chip installed	0 (0=installed)
7,6	# of 5 1/4" Drives	01 (+1=number)
5,4	Initial video mode	10 (80x25 Color)
		or 11 (80x25 Monochrome)
3,2	System board RAM	11 (64k normal)
1	Math coprocessor	0 (not necessary)
0	IPL from diskette	1 (drives exist)

This service is used to obtain an equipment list status of the PC. The CLONE returns a preset value varying only in the initial mode setting which is dependent on the type of CRT monitor in the MV, see above.

21

Interrupt 15 hex

Cassette Tape Services

Cassette Tape Access

none

Input Registers:

none

Return Registers:

AH= 86

Cflag set on at return

This service is used to access the Cassette tape unit. The CLONE always returns with the AH register having an error status of 86 and the Cflag set on.

Read Character

AH = 00

Input Registers:

35

none

Return Registers:

AH = scan code (auxiliary byte)
 AL = ASCII character (main byte)

This service is used to read a character from the keyboard. The character is removed from keyboard buffer and its contents count is decremented by one. The return registers AH/AL identify the actual key depressed (entered). The auxiliary byte (scan code) will identify the special key values when the main byte (ASCII character) is zero. Refer to Keyboard Code Chart for scan code and special key assignments.

23

Character ready

AH = 01

Input Registers:

36

none

Return Registers:

AH = scan code (auxiliary byte)
 AL = ASCII character (main byte)

ZF flag settings:

off (0) = character ready
 on (1) = character not present

This service is used to determine if a character has been entered at the keyboard. The character, if present, is not removed from the keyboard buffer and its contents counter is not decremented by one. The return registers AH/AL identify the actual key if entered. The auxiliary byte (scan code) will identify the special key values when the main byte (ASCII character) is zero. Refer to Keyboard Code Chart for scan code and special key assignments.

The state of the ZF flag indicates if a key was entered. If off (0) a key is present and is in the keyboard buffer. Note that the ZF flag has a reverse meaning, another way of looking at it is:

NZ = character ready
 ZR = character not ready

26

Keyboard Services

Interrupt 16 hex

Get shift status

AH = 02

Input Registers:

none

Return Registers:

AL = shift status bits:

- 0 - right shift depressed
- 1 - left shift depressed
- 2 - Ctrl depressed
- 3 - Alt depressed
- 4 - Scroll Lock active
- 5 - Num Lock active
- 6 - Caps Lock active
- 7 - Insert state active

This service is normally used to obtain the status of the keyboard control keys.

The DMV keyboard hardware has no equivalent function, so the CLONE returns a fixed value of zero, all states off.

Send byte to the printer

AH = 00

Input Registers:

AL = character

Return Registers:

AH = output status:

Because of the Serial interface only the following status values can be returned:

- 90 hex - operational printer
- 60 hex - inoperative printer

This service is used to output a character to the printer.

The K212/K801 Serial interface modules can not return but operative and inoperative status values.

interrupt 17 hex

Send byte to the printer

AH = 00

Input Registers:

AL = character

Return Registers:

AH = output status:

bit	description
7	not busy
6	acknowledge
5	out-paper
4	selected
3	I/O error
2	not used
1	not used
0	time-out

This service is used to output a character to the printer. The return I/O status, AH register bits, reflect an on state (1).

The K210 Centronics Parallel interface module can return the above status setting. The normal return value for an operational printer is 90 hex.

interrupt 17 hex

Initialize printer

AH = 01

Input Registers:

none

Return Registers:

AH = output status:

Refer to specific interface type Service 00 for status return values.

This service is used to initialize the printer by sending it the following two hex characters: 08, 0C.

Get printer status

AH = 02

Input Registers:

none

Return Registers:

AH = output status:

Refer to specific interface type Service 00
for status return values.

This service is used to obtain the current status of the printer.

FOR DECISION MATE V - CHARACTER SET

	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0	Ä	Å		8	9	P	'	P								
1	Æ	œ	l	l	ñ	q	a	q								
2	Å	ä	"	2	B	R	b	r								
3	Å	æ	l	3	C	S	c	s								
4	É	é	\$	4	D	T	d	t								
5	Ñ	ñ	z	5	E	U	e	u								
6	Ö	ö	ä	6	F	V	f	v								
7	ß	æ	'	7	G	W	g	w								
8	Ç	ç	(	8	H	X	h	x								
9	Ü	ü	)	9	I	Y	i	y								
A	À	à	*	:	J	Z	j	z								
B	È	è	+	;	K	L	k	(
C	'	§	,	<	L	\	l	|								
D	°	¿	-	=	M	I	m)								
E	†	0	.	>	N	^	n	-								
F	..	l	/	?	0	-	o	!								

Characters 80 - FF duplicate 00 - 7F, with high bit off.

THE CLONE - TRANSLATION SET w/hex

43

	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0	20	3C	>	0	8	P	'	P	88	04	61	π	2B	π	61	a
1	00	3C	<	1	A	Q	a	q	19	11	69	π	2B	π	62	b
2	00	1F	"	2	B	R	b	r	14	01	6F	π	2B	π	47	c
3	00	8F	"	3	C	S	c	s	61	6F	75	π	2B	π	78	d
4	00	8F	\$	4	D	T	d	t	10	16	15	2B	2D	π	53	e
5	00	1C	%	5	E	U	e	u	0A	18	85	π	2B	π	73	f
6	00	8E	&	6	F	V	f	v	12	75	61	π	π	π	60	g
7	00	8E	'	7	G	W	g	w	88	1A	6F	π	π	π	74	h
8	00	8E	(	8	H	X	h	x	65	79	10	π	π	π	58	i
9	00	76	)	9	I	Y	i	y	65	06	2B	π	π	π	54	j
A	00	8C	*	:	J	Z	j	z	08	89	2B	π	π	π	4F	k
B	00	8C	<	;	K	[	k	(	69	63	2F	π	π	π	64	l
C	00	8C	?	,	L	\	l	|	69	83	2F	π	π	π	5F	m
D	00	8C	-	=	M	]	m	)	19	59	1F	π	π	π	17	n
E	00	8C	.	>	N	^	n	-	00	50	2C	π	π	π	65	o
F	13	76	/	?	O	-	o	82	66	3E	2B	π	π	π	4E	p

28

44

	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0		)		0	8	P	'	P	88	04	61	π	2B	π	61	a
1	0	(	1	1	A	Q	a	q	19	11	69	π	2B	π	62	b
2	0	"	2	B	R	b	r	e	14	01	6F	π	2B	π	47	c
3	0	!	3	C	S	c	s	a	61	6F	75	π	2B	π	78	d
4	0	\$	4	D	T	d	t	ä	10	16	15	2B	2D	π	53	e
5	0	%	5	E	U	e	u	à	0A	18	85	π	2B	π	73	f
6	0	&	6	F	V	f	v	ä	12	75	61	π	π	π	60	g
7	0	'	7	G	W	g	w	ä	88	1A	6F	π	π	π	74	h
8	0	(	8	H	X	h	x	ä	65	79	10	π	π	π	58	i
9	0	)	9	I	Y	i	y	ä	65	06	2B	π	π	π	54	j
A	0	*	:	J	Z	j	z	ä	08	89	2B	π	π	π	4F	k
B	0	<	;	K	[	k	(	ä	69	63	2F	π	π	π	64	l
C	0	?	,	L	\	l	|	ä	69	83	2F	π	π	π	5F	m
D	0	-	=	M	]	m	)	ä	19	59	1F	π	π	π	17	n
E	0	.	>	N	^	n	-	ä	00	50	2C	π	π	π	65	o
F	0	/	?	O	-	o	ä	82	66	3E	2B	π	π	π	4E	p

45

	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0		>		0	Q	P	'	p	ç	É	a	8	+	8	a	=
1	°	<	I	1	A	Q	a	q	ü	æ	i	2	+	8	b	+
2	°	i	"	2	B	R	b	r	é	Æ	o	3	+	8	G	>
3	°	"	#	3	C	S	c	s	a	o	u	4	+	8	P	<
4	°	"	\$	4	D	T	d	t	ä	ö	ñ	+	-	8	S	?
5	°	g	%	5	E	U	e	u	å	ö	ñ	8	+	8	s	?
6	°	†	&	6	F	V	f	v	ä	u	a	8	8	8	m	/
7	°	†	'	7	G	W	g	w	ç	ù	o	8	8	8	t	~
8	°	†	(	8	H	X	h	x	e	y	l	8	8	8	P	°
9	°	v	)	9	I	Y	i	y	o	ü	+	8	8	+	T	°
A	°	)	*	:	J	Z	j	z	è	ü	+	8	8	+	0	°
B	°	<	+	:	X	I	k	(	l	c	/	8	8	8	a	/
C	°	?	,	<	L	\	l	l	i	é	/	8	8	8	?	n
D	°	?	-	=	M	J	m	)	l	Y	l	8	8	8	σ	2
E	†	†	.	>	H	^	n	~	ñ	P	<	8	8	8	u	σ
F	8	v	/	?	0	-	o	8	8	f	>	+	8	8	H	

Keys Layout

46

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	
ESC	!	@	#	\$	%	^	&	*	()	-	=	[]	↖	←	↓	↑	→	
CTL	Q	W	E	R	T	Y	U	I	O	P	()	[]	CTL	CLR	7	8	9	/
CAPS	A	S	D	F	G	H	J	K	L	:	;	'	"	NEW	-	4	5	6	*	
↑	/	Z	X	C	V	B	N	M	<	>	?	/	↑	LINE	1	2	3	NEW	LINE	
															0	00	.			

Location Assignments

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F50	F51	F52	F53	F54
E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E50	E51	E52	E53	E54
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D50	D51	D52	D53	D54
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C50	C51	C52	C53	C54
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11			B50	B51	B52	B53	B54
														A50	A52	A53		

KEYBOARD RETURNS

47

Main Keyboard - Row 2

Locations: E0 - E14

48

Main Keyboard - Row 1

Locations: F0 - F14

Unshifted				Shifted				Control			
Char	Hex	AH	AL	Char	Hex	AH	AL	Char	Hex	AH	AL
F0	F1	E0	30 00	F1	C0	54 00		F1	A0	5E 00	
F1	F2	E1	3C 00	F2	C1	55 00		F2	A1	5F 00	
F2	F3	E2	3D 00	F3	C2	56 00		F3	A2	60 00	
F3	F4	E3	3E 00	F4	C3	57 00		F4	A3	61 00	
F4	F5	E4	3F 00	F5	C4	58 00		F5	A4	62 00	
F5	F6	E5	40 00	F6	C5	59 00		F6	A5	63 00	
F6	F7	E6	41 00	F7	C6	5A 00		F7	A6	64 00	
F7	F8	E7	42 00	F8	C7	5B 00		F8	A7	65 00	
F8	F9	E8	43 00	F9	C8	5C 00		F9	A8	66 00	
F9	F10	E9	44 00	F10	C9	5D 00		F10	A9	67 00	
F10	F11	EA	00 EA	AltF1	CA	00 29		F11	AA	00 AA	
F11	F12	EB	00 EB	AltF2	CB	0C 5F		F12	AB	00 AB	
F12	F13	EC	00 EC	AltF3	CC	00 2B		F13	AC	00 AC	
F13	F14	ED	00 ED	AltF4	CD	0E 08		F14	AD	00 AD	
F14	STAB	EE	0F 00	AltF5	CE	0F 09		F15	AE	00 AE	

Unshifted				Shifted				Control			
Char	Hex	AH	AL	Char	Hex	AH	AL	Char	Hex	AH	AL
E0	ESC	10	01 10	ESC	10	01 10		ESC	10	01 10	
E1	1	31	02 31	!	21	02 21					
E2	2	32	03 32	@	40	03 40					
E3	3	33	04 33	#	23	04 23					
E4	4	34	05 34	\$	24	05 24					
E5	5	35	06 35	%	25	06 25					
E6	6	36	07 36	^	5E	07 5E					
E7	7	37	08 38	&	26	08 26					
E8	8	38	09 38	*	28	09 2A					
E9	9	39	0A 39	(	28	0A 28					
E10	0	30	0B 30	)	28	0B 29					
E11	-	2D	0C 2D	_	5F	0C 5F		^_	1F	0C 1F	
E12	=	3D	0D 3D	+	2B	0D 2B					
E13	BlkSp	8B	0E 08	BlkSp	8B	0E 08		BlkSp	9B	0E 7F	
E14	TAB	09	0F 09	TAB	09	0F 09		TAB	09	0F 09	

29

Main Keyboard - Row 3

Locations: D0 - D13

49

	Unshifted			Shifted			Control		
	Char	Hex	AH AL	Char	Hex	AH AL	Char	Hex	AH AL
D0	Cntl			Cntl			Cntl		
D1	q	71	10 71	Q	51	10 51	^Q	11	10 11
D2	w	77	11 77	W	57	11 57	^W	17	11 17
D3	e	65	12 65	E	45	12 45	^E	05	12 04
D4	r	72	13 72	R	52	13 52	^R	12	13 12
D5	t	74	14 74	T	54	14 54	^T	14	14 14
D6	y	79	15 79	Y	59	15 59	^Y	19	15 19
D7	u	75	16 75	U	55	16 55	^U	15	16 15
D8	i	69	17 69	I	49	17 49	^I	09	0E 09
D9	o	6F	18 6F	O	4F	18 4F	^O	0F	18 0F
D10	p	70	19 70	P	50	19 50	^P	10	19 10
D11	[	5B	1A 5B	(	7B	1A 7B	^C	1B	01 1B
D12	]	5D	1B 5D	)	7D	1B 7D	^J	1D	1B 1D
D13	Cntl			Cntl			Cntl		

30

Main Keyboard - Row 4

Locations: C0 - C13

50

	Unshifted			Shifted			Control		
	Char	Hex	AH AL	Char	Hex	AH AL	Char	Hex	AH AL
C0	CpLk			CpLk			CpLk		
C1	a	61	1E 61	A	41	1E 41	^A	01	1E 01
C2	s	73	1F 73	S	53	1F 53	^S	11	1F 13
C3	d	64	20 64	D	44	20 44	^D	04	20 04
C4	f	66	21 66	F	46	21 46	^F	06	21 06
C5	g	67	22 67	G	47	22 47	^G	07	22 07
C6	h	68	23 68	H	48	23 48	^H	08	23 08
C7	j	6A	1C 6A	J	4A	1C 4A	^J	0A	1C 0A
C8	k	6B	25 6B	K	4B	25 4B	^K	0B	25 0B
C9	l	6C	26 6C	L	4C	26 6C	^L	0C	26 0C
C10	;	3B	27 3B	:	3A	27 3A			
C11	'	27	28 27	"	22	28 22	^^	00	00 00
C12	`	60	29 60	~	7E	29 7E	^^	1E	07 1E
C13	N/L	88	1C 0D	N/L	88	1C 0D	^N/L	08	1C 0A

Main Keyboard - Rows 5 & 6 Locations: B99, B0 - B11, A5

51

	Unshifted				Shifted				Control			
	Char	Hex	AH	AL	Char	Hex	AH	AL	Char	Hex	AH	AL
B99	Shft				Shft				Shft			
B0	\	5C	2B	5C	|	7C	2B	7C	^|	1C	2B	1C
B1	z	7A	2C	7A	Z	5A	2C	5A	^Z	1A	2C	1A
B2	x	78	2D	78	X	58	2D	58	^X	18	2D	18
B3	c	63	2E	63	C	43	2E	43	^C	03	2E	03
B4	v	76	2F	76	V	56	2F	56	^V	16	2F	16
B5	b	62	30	62	B	42	30	42	^B	02	30	02
B6	n	6E	31	6E	N	4E	31	4E	^N	0E	31	0E
B7	m	6D	32	6D	M	4D	32	4D	^M	0D	32	0D
B8	,	2C	33	2C	<	3C	33	3C				
B9	.	2E	34	2E	)	3E	34	3E				
B10	/	2F	35	2F	?	3F	35	3F				
B11	Shft				Shft				Shft			
A5	Sp	20	39	20	Sp	20	39	20	Sp	20	39	20

31

	Unshifted				Shifted				Control			
	Char	Hex	AH	AL	Char	Hex	AH	AL	Char	Hex	AH	AL
F50	END	EF	4F	00	Alt F6	CF	6D	00	^END	AF	75	00
F51	INS	F0	52	00	Alt F7	D0	6E	00		00	00	00
F52	PgDn	F1	51	00	Alt F8	D1	6F	00	^PgDn	01	76	00
F53	PgUp	F2	49	00	Alt F9	D2	70	00	^PgUp	02	84	00
54	Brk	F4	2E	03	Alt F10	D3	71	00	Reset	03		
E50	↖	81	47	00	↖	81	47	00	^↖	91	77	00
E51	←	82	48	00	←	82	48	00	^←	92	73	00
E52	↓	83	50	00	↓	83	50	00	+	93	4E	20
E53	↑	84	48	00	↑	84	48	00	-	94	4A	2D
E54	→	85	4D	00	→	85	4D	00	→	95	74	00
D50	DEL	86	53	00	CLR	7F	00	7F	^CLR	96	00	96
D51	7	37	08	37	Home	D7	47	00	^Home	07	77	00
D52	8	38	09	38	↑	D8	48	00	8	88	60	38
D53	9	39	0A	39	PgUp	D9	49	00	^PgUp	09	84	00
D54	/	2F	35	2F	/	DF	37	2F	/	8F	37	2F

Numeric Pad - Rows 4 - 6 Locations: C50/54, B50/54, A50/53

	Unshifted			Shifted			Control		
	Char	Hex	AH AL	Char	Hex	AH AL	Char	Hex	AH AL
C50	-	2D	0C 2D	-	F4	6B 2D	-	F5	6B 2D
C51	1	34	05 34	LtAw	D4	4B 00	LtAw	B4	73 00
C52	5	35	06 35	5	D5	06 35	5	B5	61 35
C53	6	36	07 36	RtAw	D6	4D 00	RtAw	B6	74 00
C54	*	2A	09 2A	PrtSc	DA		*PrtSc	BA	72 00
B50	+	2B	0D 2B	+	DB	6C 2B	+	BB	6C 2B
B51	1	31	02 31	END	DC	4F 00	*END	BC	75 00
B52	2	32	03 32	DnAw	DD	5B 00	2	BD	62 32
B53	3	33	04 33	PgDn	DE	51 00	*PgDn	BE	76 00
B54	N/L	8B	1C 00	N/L	8B	1C 00	N/L	9B	1C 00
A50	0	30	0B 30	0	30	0B 30	0	30	0B 30
A52	00	30	0B 30	00	30	0B 30	00	30	0B 30
A53	.	2E	34 2E	.	2E	34 2E			

54
The use of the CLONE in a commercial environment is subject to the following conditions and mutual agreements:

1. Payment of the site license fee is payable to D.A.Roger. The fee is based on the number of Decision Mate V systems available for use (inventory) at your specific commercial location or within your span of organizational control. Reference SITE LICENSE PRICE SCHEDULE.
2. You are authorized to make copies of the executable program and/or install them on multiple CPUs, in its original, unmodified form, up to the limit specified in the site license.
3. It is your responsibility to make the additional copies from the original distribution disk for installation on the systems to use the CLONE. Installation may be to a hard disk or network file server.
4. You may make copies of the program documentation, in both its printed form and machine readable form, without restriction.
5. You will be notified of future versions of the CLONE. Their use is granted as part of this license at no additional fee. A small service charge will be required covering new documentation, media and mailing costs.

I, the under signed as an authorized agent of my company, enter into and agree to abide by the terms and conditions of this license.

Signature

Date

Name (please print or type)

DMV System Cont.

Title

Site/Organization Name

Company

55

ORDER FORM

Please check the appropriate license you wish to purchase:

() Non-commercial single user/cpu license of the CLONE.

() Commercial multi-user/cpu site license for:

DMV's available (inventory) _____.

Payment of \$_____ is enclosed, per Price Schedule, plus \$5.00
for Postage & Handling.

Form of payment is check or money order payable to D.A.Roger.

Name

Company

Address

City

State

Zip

Send to:

David A. Roger
1840 Donalor Dr.
Escondido, CA 92027

For orders outside of the U.S., please add an additional \$5.00, and
enclose an International money order payable in U.S. currency.

For commercial site license orders, please enclose a signed copy of
the site license agreement. 13

```

#####
# CLONE - Ver 3.02 - (C) Copyright 1986 by D.A.Roger; ALL RIGHTS RESERVED #
#####
# Licensed to: D.A. Roger *0000#####
# *** All DMV Keys are the same with the exception of: *** #
# +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+ #
# Ctrlb      o      o      o      o      o  o^END  o      o^PgDn  o^PgUp  oSysRst#
# ShftbAlt-F1bAlt-F2bAlt-F3bAlt-F4bAlt-F5b  bAlt-F6bAlt-F7bAlt-F8bAlt-F9bAltF10b #
#      bCpy 1  bCpy to  bDup    bSkp to  bSftTABb  b END    b INS    b PgDn  b PgUp  bBreak  b #
# +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+ #
# Keyb F11  b F12  b F13  b F14  b F15  b  b F16  b F17  b F18  b F19  b F20  b #
# +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+ #
#                                     b TAB  b  b Home*  b LtAw*  b DnAw  b UpAw  b RtAw*  b #
# >>> F11-14 DOS Edit Keys <<<      +-----+-----+-----+-----+-----+-----+ #
#                                     Shftb      b Home*  b UpAw  b PgUp*  b      b #
# >>All Decision Mate V Keys      b"DEL"  b 7    b 8    b 9    b /    b #
# are expanden to include          +-----+-----+-----+-----+-----+-----+ #
# their scancode when input          ^CLR^  b LtAw*  b      b RtAw*  bPrtSc*  b #
# through Interrupt 16h. For      *Note:      b 4    b 5    b 6    b *    b #
# DOS access of Function and      Control key  +-----+-----+-----+-----+-----+ #
# Directional keys; execute      definition    b END*  b DnAw  b PgDn*  b      b #
# CLONE with "+f" option.<<      supported.    b 1    b 2    b 3    b NL    b #
#                                     +-----+-----+-----+-----+-----+-----+ #
#####
#####DOS 2.11#####
A:0>

```