

41CL Memory Reference

05/08/17

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0x0F6	SMATH2L	SND2	2	Sandmath II ROM, pg 1	0xB35356D4	07/13/12
0x0F7	SMATH2U		3	Sandmath II ROM, pg 2	0xDB82EFF5	07/13/12
0x0F8	MAHJONG1	MAHJ	10	Mahjong ROM, pg 1	0xE176B636	06/02/16
0x0F9	MAHJONG2			Mahjong ROM, pg 2	0x2C60830F	06/02/16
0x0FA	IERF1	IERR	1	IERF ROM, pg 1	0x54E81895	04/22/13
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0x100	ADVMTRX1	MTRA	22	Advanced Matrix ROM, pg 1, bnk 1	0x68B79323	02/16/12
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0x102	CCDADV	CCDA	10	CCD Advanced ROM	0x706C0B22	02/17/12
0x103	GEOMETRY	GMTY	16	Geometry 11 ROM	0x1C7F4143	02/16/12

0x104	ADVMTRX2	MTRA	22	Advanced Matrix ROM, pg 2, bnk 1	0xF36D67ED	02/16/12
0x105	ADVMTRX3		24	Advanced Matrix ROM, pg 2, bnk 2	0x379659C1	02/16/12
0x106	NUMTHRY	NTHY	16	Number Theory ROM	0x1A82B478	02/17/12
0x107	DIGITPAC	DIGT	24	DigitPAC ROM	0xE8AD50A6	02/16/12
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0x115	CLUTLSB2			Power-CL Utilities, bnk 2	0x74EB21F2	09/17/14
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0x125	OUTERPLN	OPLN	21	Outer Planets ROM	0xF5D8BB73	05/17/16
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0x12A	SYSDEMO3			HP41 System Demo, pg 3	0x43ADC256	12/12/12
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0x130	SNEAP1	NEA1	21	SNEAP ROM, pg 1	0xBF50A7B3	10/07/12
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0x13A	HVAC	HVAC	16	HVAC Solutions	0xC911BCF8	02/13/13
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0x158	NEXT_2C	NEXT	6	NEXT ROM	0x9787FBD4	05/01/13
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0x15B	CMT_2			CMT-100 Eprom Test ROM, pg 2	0xA1C2F451	05/25/13
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0x164	4WINS	4WIN	16	4WINS Game ROM	0x17CB9809	09/05/16
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0x166	ALL_FF	YFSD	17	41CL SD Card Functions	0x53D36BD2	
0x167	YFNF-1E	YFNF	16	41CL Memory Functions -1E	0xD417BF8D	08/05/16
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0x169	OSXB2			Lib-4 OS/X Bank-Switched ROM, bnk 2	0x242C99E4	08/14/16
0x16A	OSXB3			Lib-4 OS/X Bank-Switched ROM, bnk 3	0xAA6E8246	03/24/17
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0x16E	AECPROG	PROG	18	Program Generator ROM	0x1C33B87A	08/24/13
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0x182	PWREXT3			PowerCL Extreme, bnk 3	0x20BE9505	08/16/16
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0x184	VERMPACK	VERM	27	Vermpack 1A	0x3986AA52	05/23/14
0x185	TVM_1E	TVMY	22	TVM Module 1E	0x95BBC5C6	05/28/14
0x186	NUTIP-1A	ITCP	4	NutIP TCP/IP ROM 1A	0x993752D4	05/23/14

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0x188	FORCAST1	FCST	10	Forecast ROM	0x8FCB260B	06/28/14
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0x193	ETSII6A	ETS9	16	ETSII6A ROM	0xFB2C3FED	12/15/16
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0x1CD	TI2024		12	TDS Instrument ROM, pg 2	0x98D9A27A	06/01/15
0x1CE	TP2243	TDSP	8	TDS Plotter ROM, pg 1	0x9801DAC7	06/01/15
0x1CF	TP2244		9	TDS Plotter ROM, pg 2	0xF944C90F	06/01/15
0x1D0	TIDES	TIDW	10	Tides ROM	0xB2C7D535	10/04/15
0x1D1	PORTSL	PRTW	11	US Ports ROM, pg 1	0x737C5C10	10/04/15
0x1D2	PORTSU			US Ports ROM, pg 2	0x26852531	10/04/15
0x1D3	HPCALEND	CLND	12	HP Calendar Solutions	0x933814CA	10/04/15
0x1D4	RUBIKS	RUBK	8	Rubik's Cube ROM	0x264D420D	10/19/15
0x1D5	TINKER1	TAFB	21	Tinker AFB ROM, pg 1	0xD06E207D	10/19/15
0x1D6	TINKER2		31	Tinker AFB ROM, pg 2	0xE43B37DC	10/19/15
0x1D7	JMB_CAL	JMBC	17	JMB Calendar ROM	0x3B68614D	10/25/15
0x1D8	USERCAL	UCLN	18	User Calendar ROM	0xE0DAB2CA	10/25/15
0x1D9	FILTERS1	EEFD	17	EE Filter Design ROM, pg 1	0x1E8384EC	11/15/15
0x1DA	FILTERS2		18	EE Filter Design ROM, pg 2	0xCAD49825	12/15/16
0x1DB	CRYPTO41	CRTO	10	Cryptography Module	0x28BC8649	11/20/15
0x1DC	XFRAME	XBFR	30	Direct Stiffness Method, pg 1	0x02AE22A3	11/15/15
0x1DD	XBEAMS			Direct Stiffness Method, pg 2	0xF95A4251	11/15/15
0x1DE	TRUSS	XTRS	30	Direct Stiffness Method: Trusses, pg 1	0x88058D2D	11/15/15
0x1DF	XTRUSS			Direct Stiffness Method: Trusses, pg 2	0xFB3DAAD6	11/15/15

0x1E0	SWAPMTH	3SWP	12	Swapdisk Math, pg 1	0xF8896B0C	02/10/17
0x1E1	SWAPPOL		13	Swapdisk Math, pg 2	0xF3907193	02/10/17
0x1E2	XMSTAT	XTAT	6	XM Statistics Module	0x315C68DD	12/30/15
0x1E3	TRANSNEP	EPTN	23	Trans-Neptunian Planets, 2016-2025	0xB79E2C7E	11/30/15
0x1E4	COUNTRY	CITY	18	Country/Capital ROM	0x5DF3F873	12/18/15
0x1E5	SERIES	SERI	18	Sums & Series ROM	0x7D90435F	03/26/17
0x1E6	PLANETS	PLAN	9	Planets ROM	0x17FFE68E	05/10/16
0x1E7	PLUTOIDS	PLTO	10	Plutoids ROM	0xBC96B6FA	05/10/16
0x1E8	SPANISH	WORD	31	English/Spanish Dictionary ROM, pg 1	0x14567DB7	01/04/16
0x1E9	ENGLISH			English/Spanish Dictionary ROM, pg 2	0xBBFC04E6	01/04/16
0x1EA	GJM_2B_1	GJMR	31	Greg J McClure's ROM, pg 1	0x15DE7F71	08/19/16
0x1EB	GJM_2B_2			Greg J McClure's ROM, pg 2	0xC6FFD975	08/19/16
0x1EC	ELLIPTIC	ELPT	17	Elliptic ROM	0x1DD1C496	07/26/16
0x1ED	PERIOD1	HTAB	13	(HEPAX RAM only) Periodic Table, pg 1	0xCCA0B09D	02/23/16
0x1EE	PERIOD2		14	(HEPAX RAM only) Periodic Table, pg 2	0x23A57B1A	02/23/16
0x1EF	PERIOD3		16	(HEPAX RAM only) Periodic Table, pg 3	0x395E9D7C	02/23/16
0x1F0	41ZL1	Z4DL	1	41Z Deluxe, pg 1, bnk 1	0xD99F3694	03/15/17
0x1F1	41ZL2			41Z Deluxe, pg 1, bnk 2	0x79CA2B0A	03/15/17
0x1F2	ITGDIFF	FRID	18	Fractional Integro-Differentiation ROM	0x60FB8998	03/26/17
0x1F3	RECURSE	RCSN	9	Recursion ROM	0xE3D80EBC	03/16/17
0x1F4	41ZU1	Z4DL	4	41Z Deluxe, pg 2, bnk 1	0xCE112F82	02/26/17
0x1F5	41ZU2			41Z Deluxe, pg 2, bnk 2	0x7E2A062E	03/07/17
0x1F6	GAMESB1	GSB2	16	HP-41 Games Solution Book 1/2, pg 1	0x843AD40C	06/03/16
0x1F7	GAMESB2			HP-41 Games Solution Book 1/2, pg 2	0x53A51C5C	06/03/16
0x1F8	E-6A_1	E-6A	21	E-6A W&B, pg 1	0x30B8DDA3	10/31/16
0x1F9	E-6A_2		31	E-6A W&B, pg 2	0xCAEE69CA	10/31/16
0x1FA	E-6A_3		10	E-6A W&B, pg 3	0xD09ED147	10/31/16
0x1FB	E-6A_4		9	E-6A W&B, pg 4	0xB3066F07	10/31/16
0x1FC	AP550-3L	TGT3	21	AP550 A3 Targeting ROM, pg 1	0x30BD2647	03/26/17
0x1FD	AP550-3U		31	AP550 A3 Targeting ROM, pg 2	0x6079942F	03/26/17
0x1FE	ALL_FF			empty	0x53D36BD2	
0x1FF	ALL_FF			empty	0x53D36BD2	
0x800				41C Registers 0-3FF		
0x801				Registers 400-FFF (not utilized by the OS)		
0x802						
0x803						
0x804				41CL MMU registers		
0x805		YBFR		Memory Buffer		
0x806		CFDB		Memory Buffer or CFLDB location		
0x807						
0x808						
0x809						
0x80A						
0x80B						
0x80C						

0x80D						
0x80E						
0x80F						
0x810				Page 0 of Sector Buffer		
0x811				Page 1 of Sector Buffer		
0x812				Page 2 of Sector Buffer		
0x813				Page 3 of Sector Buffer		
0x814				Page 4 of Sector Buffer		
0x815				Page 5 of Sector Buffer		
0x816				Page 6 of Sector Buffer		
0x817				Page 7 of Sector Buffer		
0x818						
0x819						
0x81A						
0x81B						
0x81C						
0x81D						
0x81E						
0x81F						
0x820						
0x821						
0x822						
0x823						
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0x825						
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NOTES:

1. Flash memory starts at page 0x000, and RAM memory starts at page 0x800.

2. A blank page in Flash memory is different from an empty page in Flash memory. A blank page contains 0x0000 in every location, and can be safely plugged into a Port. An empty (erased or unprogrammed) page contains 0xFFFF in every location, which will lock up the 41CL when plugged into a Port. A blank page has a YCRC value of 0xD666D0E4, while an empty page has a YCRC value of 0x53D36BD2.

3. Flash memory is always erased by sectors. Normally a sector consists of eight pages, and sector boundaries are highlighted in the table. Either the the top sector or the bottom sector is unique, and is erased by subsector. Refer to the “41CL Flash Updates” document for the details.

RAM Memory Details

Physical Address	Contents	Used for
0x800000 - 0x800003	Register 000	T register
0x800004 - 0x800007	Register 001	Z register
0x800008 - 0x80000B	Register 002	Y register
0x80000C - 0x80000F	Register 003	X register
0x800010 - 0x800013	Register 004	L register
0x800014 - 0x800017	Register 005	ALPHA register 1-7
0x800018 - 0x80001B	Register 006	ALPHA register 8-14
0x80001C - 0x80001F	Register 007	ALPHA register 15-21
0x800020 - 0x800023	Register 008	ALPHA register 22-28
0x800024 - 0x800027	Register 009	temp ALPHA scratch
0x800028 - 0x80002B	Register 00A	OS functions
0x80002C - 0x80002F	Register 00B	
0x800030 - 0x800033	Register 00C	
0x800034 - 0x800037	Register 00D	
0x800038 - 0x80003B	Register 00E	FLAG register
0x80003C - 0x80003F	Register 00F	OS functions
0x800040 - 0x8000FF	Registers 10 - 3F	not visible to OS
0x800100 - 0x800103	Register 040	X-Memory
0x800104 - 0x800107	Register 041	
.	.	
.	.	
0x8002F8 - 0x8002FB	Register 0BE	
0x8002FC - 0x8002FF	Register 0BF	
0x800300 - 0x800303	Register 0C0	
0x800304 - 0x800307	Register 0C1	Key Assign Buffer, Alarm Buffer, I/O Buffers, Program memory Data
.	.	
.	.	
0x8007F8 - 0x8007FB	Register 1FE	
0x8007FC - 0x8007FF	Register 1FF	
0x800800 - 0x800803	Register 200	not visible to OS
0x800804 - 0x800807	Register 201	X-Memory
0x800808 - 0x80080B	Register 202	
.	.	
.	.	
0x800BB8 - 0x800BBB	Register 2EE	
0x800BBC - 0x800BBF	Register 2EF	
0x800BC0 - 0x800C03	Registers 2F0 - 300	not visible to OS

0x800C04 - 0x800C07	Register 301		X-Memory
0x800C08 - 0x800C0B	Register 302		
.	.		
0x800FB8 - 0x800FBB	Register 3EE		
0x800FBC - 0x800FBF	Register 3EF		
0x800FC0 - 0x800FFF	Registers 3F0 - 3FF		not visible to OS
0x801000 - 0x801FFF	Registers 400 - 7FF		Expanded Memory 1
0x802000 - 0x802FFF	Registers 800 - BFF		Expanded Memory 2
0x803000 - 0x803FFF	Registers C00 - FFF		Expanded Memory 3
0x804000	41C Register Address		REGADD
0x804001 - 0x80400B	reserved		
0x80400C	Page 0 MMU registers (only one bank)	set 0	Page 0 MMU data
0x80400D		set 1	
0x80400E		set 2	
0x80400F		set 3	
0x804010 - 0x804017	41CL Extra/Extreme functions internal use		
0x804018	Turbo Mode storage location		Light Sleep
0x804019	41CL Extra/Extreme functions internal use		
0x80401A	CPU ST[14:8] storage location		Light Sleep
0x80401B	reserved		
0x80401C	Page 1 MMU register (only one bank)	set 0	Page 1 MMU data
0x80401D		set 1	
0x80401E		set 2	
0x80401F		set 3	
0x804020 - 0x80402B	41CL Memory Functions internal use		
0x80402C	Page 2 MMU register (only one bank)	set 0	Page 2 MMU data
0x80402D		set 1	
0x80402E		set 2	
0x80402F		set 3	
0x804030	Page 4 MMU register dynamic storage		
0x804031 - 0x80403B	41CL Update Functions internal use		
0x80403C	Page 3 MMU register (only one bank)	set 0	Page 3 MMU data
0x80403D		set 1	
0x80403E		set 2	
0x80403F		set 3	

0x804040	Page 4, Bank 1 MMU registers	set 0	Page 4 MMU data
0x804041		set 1	
0x804042		set 2	
0x804043		set 3	
0x804044	Page 4, Bank 3 MMU registers	set 0	
0x804046		set 1	
0x804046		set 2	
0x804047		set 3	
0x804048	Page 4, Bank 2 MMU registers	set 0	
0x804049		set 1	
0x80404A		set 2	
0x80404B		set 3	
0x80404C	Page 4, Bank 4 MMU registers	set 0	
0x80404D		set 1	
0x80404E		set 2	
0x80404F		set 3	
0x804050 - 0x804053	Page 5, Bank 1 MMU registers	sets 0-3	Page 5 MMU data
0x804054 - 0x804057	Page 5, Bank 3 MMU registers	sets 0-3	
0x804058 - 0x80405B	Page 5, Bank 2 MMU registers	sets 0-3	
0x80405C - 0x80405F	Page 5, Bank 4 MMU registers	sets 0-3	
0x804060 - 0x804063	Page 6, Bank 1 MMU registers	sets 0-3	Page 6 MMU data
0x804064 - 0x804067	Page 6, Bank 3 MMU registers	sets 0-3	
0x804068 - 0x80406B	Page 6, Bank 2 MMU registers	sets 0-3	
0x80406C - 0x80406F	Page 6, Bank 4 MMU registers	sets 0-3	
.	.		.
0x8040E0 - 0x8040E3	Page E, Bank 1 MMU registers	sets 0-3	Page E MMU data
0x8040E4 - 0x8040E7	Page E, Bank 3 MMU registers	sets 0-3	
0x8040E8 - 0x8040EB	Page E, Bank 2 MMU registers	sets 0-3	
0x8040EC - 0x8040EF	Page E, Bank 4 MMU registers	sets 0-3	
0x8040F0 - 0x8040F3	Page F, Bank 1 MMU registers	sets 0-3	Page F MMU data
0x8040F4 - 0x8040F7	Page F, Bank 3 MMU registers	sets 0-3	
0x8040F8 - 0x8040FB	Page F, Bank 2 MMU registers	sets 0-3	
0x8040FC - 0x8040FF	Page F, Bank 4 MMU registers	sets 0-3	
0x804100 - 0x804FFF	41CL functions internal use		
0x805000 - 0x805FFF	Memory Buffer (1 4Kx16 page)		
0x806000 - 0x806FFF	CFLDB location		
0x807000 - 0x80FFFF	User RAM (9 4Kx16 pages)		
0x810000 - 0x817FFF	Sector Buffer (8 4Kx16 pages)		
0x818000 - 0x87FFFF	User RAM (104 4Kx16 pages)		

NOTES:

1. Each seven-byte 41C register is stored in four successive memory locations:

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
addr lsb																
00	Byte 1								Byte 0							
01	Byte 3								Byte 2							
10	Byte 5								Byte 4							
11	unused								Byte 6							

2. Each MMU entry is stored in a single memory location:

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	EN	LCK	MULTI	A23	A22	A21	A20	A19	A18	A17	A16	A15	A14	A13	A12	

Bit 15 is the Enable (EN) bit. If this bit is zero, the MMU entry is ignored and the corresponding page and bank will be fetched from a Port.

Bit 14 is the Lock (LCK) bit, used only with the 41CL Extreme Functions. If this bit is set to one the entry cannot be changed, except with either the **UNLOCK** function or the **MMUCLR** function.

Bits 13 and 12 are the Multi-page Image (MULTI) bits, used only with the 41CL Extreme Functions. These bits are managed automatically by the **PLUG** and **PPLUG** functions, with the following meanings:

13	12	MULTI
0	0	Not part of a multi-page image
0	1	First page of a multi-page image
1	1	Middle page of a multi-page image
1	0	Last page of a multi-page image

Bits 11-0 hold the twelve address bits to be substituted for the Page address (bits 15-12) portion of the logical address, to create the physical address.

3. MMU register sets 1-3 are used only by the 41CL Extreme Functions.

