Lab report #9 Saad Ahmad (20P-0051)

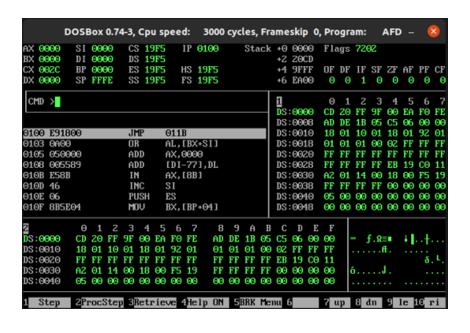
Subroutines with parameters:

The concept of subroutine with parameter is a little bit different with the high-level language's functions. In parameter subroutine the parameter is actually stored in stack as we have the limited registers, as in stack there is the concept of first in and last out so with the help of stack, we can store our parameters on it and can easily access it by base pointer. And when we end our subroutine we will add a number with the ret keyword which will clean the stack once our code is executed.

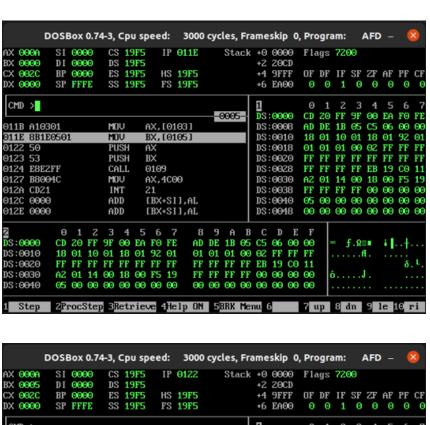
Code:

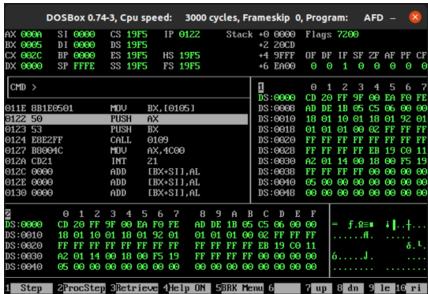
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report9.asm ×
1 [org 0x0100]
   jmp main
  data: dw 10 , 5
   result: dw 0
    ftn:
        push bp
        mov bp , sp
        mov ax, [bp + 6]
       mov bx , [bp + 4]
        add ax , bx
        mov [result] , ax
        pop bp
        ret 4
    main:
       mov ax , [data]
        mov bx, [data + 2]
        push ax
        push bx
        call ftn
        mov ax , 0x4c00
        int 0x21
```

Output:

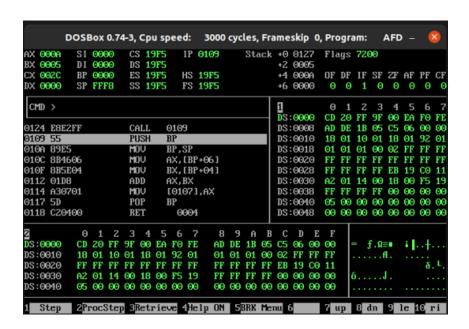




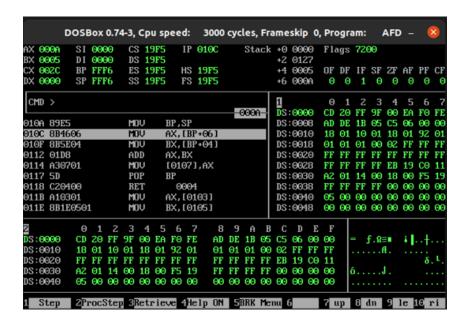




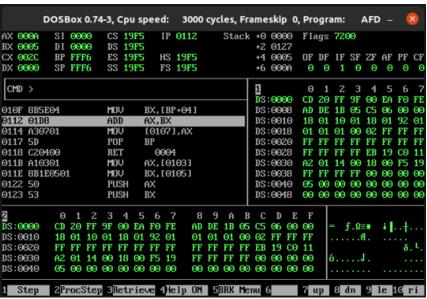
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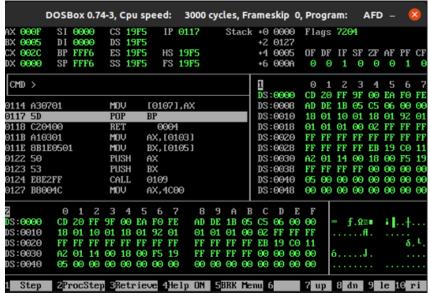
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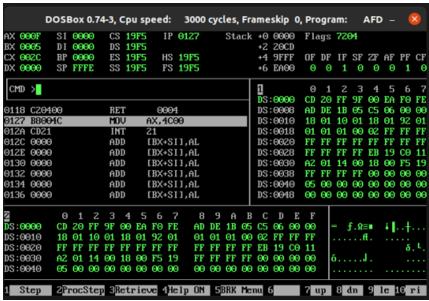




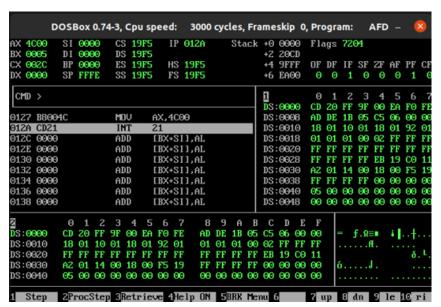
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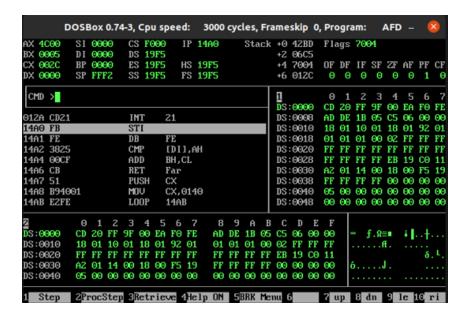






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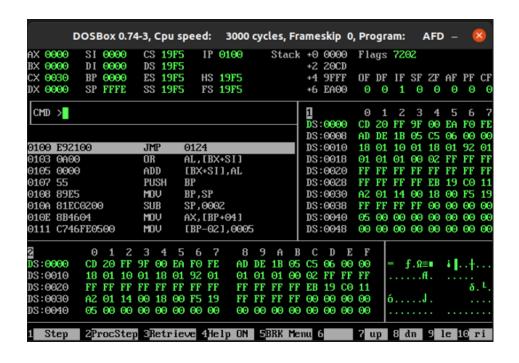
LOCAL VARIABLES

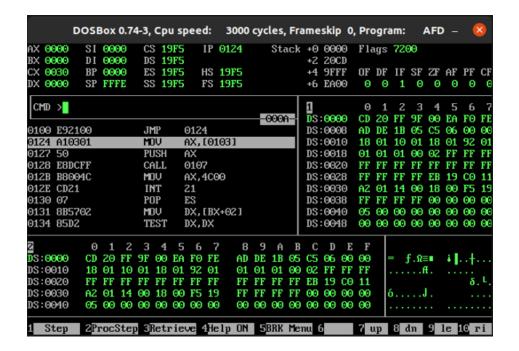
An important role of the stack is in the creation of local variables that are only needed while the subroutine is in execution and not afterwards. They should not take permanent space like global variables. Local variables should be created when the subroutine is called and discarded afterwards. So that the spaced used by them can be reused for the local variables of another subroutine. They only have meaning inside the subroutine and no meaning outside it.

Code:

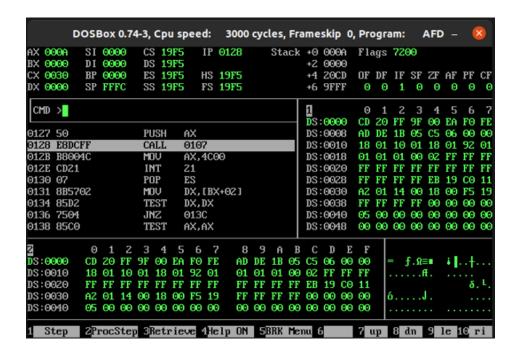
```
coal > ASM ftn_loc.asm
 1 [org 0x0100]
 3 jmp main
 5 data: dw 10
 6 result: dw 0
     ftn:
       push bp
       mov bp , sp
        sub sp , 2
        mov ax , [bp + 4]
       mov bx , word[bp - 2]
        add ax , bx
        mov [result] , ax
        mov sp , bp
        pop bp
        ret 2
     main:
        mov ax , [data]
        push ax
        call ftn
        mov ax , 0x4c00
        int 0x21
 33
```

Output:

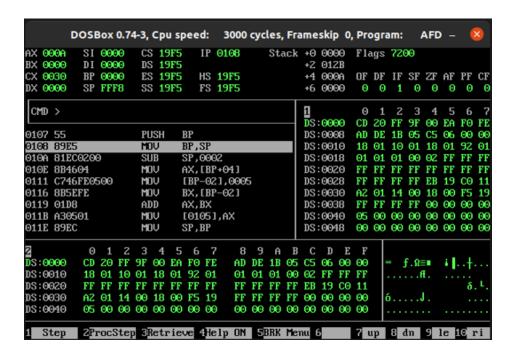




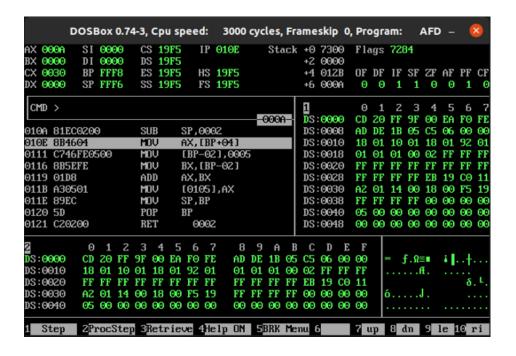
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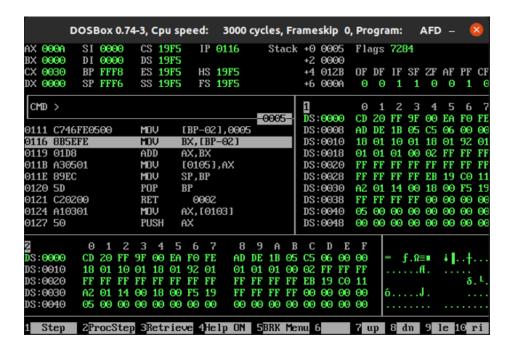
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9107 55				Pl	JSH	I	BP						DS	:001	LO	18	01	10	01	18	01	92	0
0108 89	E5			MC)Ų	1	BP , S	SP				_	DS	:00:	18	01	01	01	$\Theta\Theta$	02	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{I}$
910A 81		9		SI	JB		SP,0	9000	2				DS	:002	20	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{I}$						
010E 8B	4604			MC	JŲ	f	ìχ, Ι	[BP	+041			- 1	DS	: 002	28	FF	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{E}\mathbf{B}$	19	C0	1:
9111 C7		500		MC					1,000	5		- 1		:000		ΑZ	01	14	$\Theta\Theta$	18	∞	F5	19
0116 8B				M					-021			- 1		:003	-	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	00	00	∞	
0119 01					D		ìχ,Ι					- 1		:00		05	Θ	90	00	00		∞	
011B A3	0501			M	JŲ	١	[010	951	,AX				DS	:004	18	00	9 0	00	00	00	00	9 0	00
2	0	1	z	3	4	5	6	7	8	9	A	В	С	D	Е	F	Т						
DS:0000	CD	20	$\mathbf{F}\mathbf{F}$	9F	00	ΕA	FΘ	FE	AD	DE	1B	05	C 5	96	00	00	١.	- :	f.n:		41	+	
DS:0010	18	01	10	01	18	01	92	01	01	01	01	$\Theta\Theta$	02	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	- 1		1	Ŧ.		:	
DS:0020	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	FF	FF	$\mathbf{F}\mathbf{F}$	EB	19	CO	11						δ	٠.
DS:0030	AZ	01	14	∞	18	00	F5	19	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	Θ	Θ	00	00	- li	ó.,		J.			
DS:0040	05	00	00	00	9 0	00	00	00	00	00	90	9 0	00	00	90	00							
il Step	2P	enc?	Ster	1 3i	Reti	ries	NP Z	He	lp ON	. 5i	BRK	Men	nu (3		7	m	8	dn	9	le i	0	ri



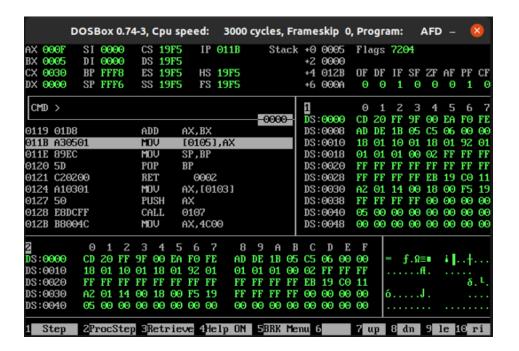
	DOSE	Зох	0.7	4-3,	Ср	u sp	ee	d:	3000	cyc	les,	Fra	me	skip	0,	Pro	ogra	am:	,	AFC) –	(×
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CX 0030 DX 0000		FFI FFI			19 19				19F5 19F5				+4 +6	000 000		OF O	ur O		SF 0	<u>د</u> لا 0	HI O	PF O	CF
DA 0000	- 31	111		- 01	- 1	713			1713			_			~	_	_		_	_	_	_	_
CMD >												-1	1			0	1	2	3	4	5	6	7
_												\dashv		:000		CD	20	$\mathbf{F}\mathbf{F}$	9F	9 0	ΕA	FΘ	~~
0108 89				Mi			BP , S					_		:000		ΑD	DE	1B	05	C5		00	-
010A 81		9		St			SP,(:001		18	01	10	01	18	01	92	
010E 8B				MC					+04]			- 1		:001		01	01	01	00	02	$\mathbf{F}\mathbf{F}$	FF	FF
0111 C7		500		MC					1,0005	•		- 1		:002		FF	FΕ	FF	FF	FF	FF	FF	FF
0116 8B				MC					-021			- 1		: 002		FF	FF	FF	FF	EB	19	CO	
0119 01				ΑI			iX,I					- 1		:003		AZ	01	14	90	18	99	F5	19
011B A30				MC					,AX			- 1		:003		FF	FF	FF	FF	00	00	00	
011E 89	EC			Mi			SP , I	ВP				- 1	_	:004		05	90	00	00	00	99	00	
0120 5D				PO	JP	1	BP						DS	:004	18	9 0	9 0	00	00	90	00	9 0	00
2	0	1	2	3	4	5	6	7	8	9	A	В	С	D	Е	F	Т						
DS:0000	CD	20	\overline{FF}	9F	00	EΑ	FΘ	FΕ	AD	DΕ	1B	05	C 5	06	00	00	١,	- :	f.Ω		äΙ	+	
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DS:0020	FF	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	FF	FF	FF	FF	FF	FF	EB	19	CO	11						δ	, L
DS:0030	AZ	01	14	00	18	00	F5	19	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	00	00	00	00		ó.,		J.			
DS:0040	05	00	00	90	00	00	00	00	00	00	00	00	00	00	00	90							
1 Step	2Pi	rocS	Ste	3	Reti	riev	ле 4	Не	lp ON	5	BRK	Men	nu (6		7 (ιp	8	dn	9	le	[0]	ci



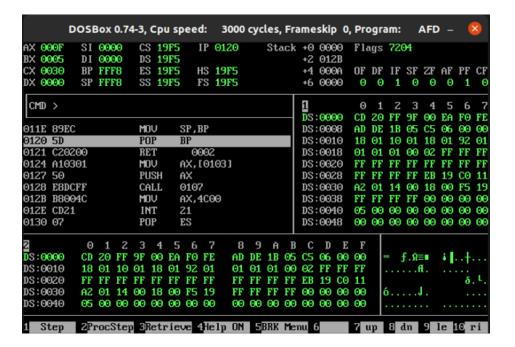
	DOSE	Зох	0.7	4-3,	Ср	u sp	ee	d:	3000	сус	les,	, Fra	me	skip	0,	Pro	ogra	am:	,	AFD	-	(×
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DX 0000	SP	FFI	6	SS	3 19	9F5	1	FS :	19F5				+6	000	ĐÀ	0	0	1	1	0	0	1	0
CMD >												Т	1			0	1	2	3	4	5	6	7
											730	э–		:000	90	CD	20	$\mathbf{F}\mathbf{F}$	9F	∞	ΕA	FΘ	\mathbf{FE}
010E 8E	4604			MC		ſ	ìΧ, I	[BP	+04]				DS	:000	98	ΑD	DΕ	1B	05	C5	96	00	$\Theta\Theta$
0111 C7		500		MC)V				1,000	5			DS	:001	LO	18	01	10	01	18	01	92	01
0116 8E				MC	JŲ]	BX,I	[BP-	-021				DS	:001	18	01	01	01	90	02	$_{\mathrm{FF}}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$
0119 01				ΑI		f	λX,Ι	BX				- 1		:002		$\mathbf{F}\mathbf{F}$							
011B A3				MC	JŲ		[010	951	,AX			- 1	DS	: 002	28	$_{\rm FF}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{E}\mathbf{B}$	19	CO	11
011E 89	EC			MC	JŲ	*	SP,I	BP				- 1	DS	:003	30	AΖ	01	14	∞	18	Θ	F5	19
0120 5D				PC	JΡ]	BP					- 1	DS	:003	38	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	∞	00	∞	$\Theta\Theta$
01Z1 CZ				$\mathbf{R}\mathbf{I}$	\mathbf{T}			90Z				- 1		:004		0 5	00	Θ	00	00	Θ	00	$\Theta\Theta$
0124 A1	.0301			MC	JŲ	í	AΧ,Ι	[010	031				DS	:004	18	9 0	00						
2	0	1	z	3	4	5	6	7	8	9	A	В	С	D	Е	F	Т						
DS:0000	CD CD	20	$\mathbf{F}\mathbf{F}$	9F	00	ΕA	FΘ	\mathbf{FE}	AD	DΕ	1B	05	C5	96	00	90	٠,	- :	f.n		¥Ι.	+.	
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	02	$\mathbf{F}\mathbf{F}$	FF	FF			٠١	Æ.			
DS:0020	FF	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	EB	19	CO	11						δ	١.
DS:0036	A2	01	14	$\Theta\Theta$	18	00	F5	19	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	00	00	00	90		ó		J.			
DS:0040	05	00	00	90	00	00	00	00	00	00	00	00	00	00	00	00							
1 Step	2Pi	rocS	Ste	3	leti	rie	ve 4	Не	lp ON	5	BRK	Men	nu (6		7 t	ιp	8	dn	9	le i	10	ri



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BX 0005	DI				1								+2	000						-			
CX 0030		FFI			_1				19F5				+4	012		OF	DF		SF	ZF	ΑF	PF	CF
DX 0000	SF	FF	ь	25	3 19	Jr5	1	3	19F5				+6	000	ж	0	Θ	1	1	0	0	1	0
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Ь												\dashv		000	90	CD	20	$\mathbf{F}\mathbf{F}$	9F	00	ΕA	F0	FΕ
0116 8B	5EFE			MC	JŲ	1	BX,I	BP-	-021				DS	:000	98	ΑD	DΕ	1B	05	C5	96	∞	00
0119 01				ΑI	_	_	λX,Ι							:001		18	01	10	01	18	01	92	01
011B A3				MC			[016		,AX					:001		01	01	01	00	02	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$
011E 89	EC			MC			SP, I	3P						:002		$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	FF	FF	FF	FF	FF
0120 5D				PO		1	BP					- 1		:002		FF	FF	FF	FF	EB	19	C0	11
01Z1 CZ				RI				90Z	003			- 1		:003	-	AZ	01	14	00	18	99	F5	19
0124 A1				MC			ìΧ, I	010	931			- 1		:003		FF	FF	FF	FF	00	00	00	00
0127 50					ISH		ìΧ					- 1		:004		05 05	90	00	00	00	00	00	00
0128 E8	DCFF			Cf	ıLL		9107						DS	:004	18	99	00	90	00	00	00	00	0.0
2	0	1	2	3	4	5	6	7	8	9	A	В	С	D	Е	F	П						
DS :0000	CD	20	$\mathbf{F}\mathbf{F}$	9F	9 0	ΕA	FΘ	\mathbf{FE}	AD	DE	1B	05	C5	96	00	99	١.	- ;	f.n:		ΑĮ.	+	
DS:0010	18	01	10	01	18	01	92	01	01	01	01	∞	02	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	- 1		1	ŧ.			
DS:0020	$\mathbf{F}\mathbf{F}$	EB	19	CO	11						δ	. ե.											
DS:0030		01	14	∞	18	∞	F5	19	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	FF	∞	$\Theta\Theta$	00	00		ó.,		١.			
DS:0040	05	00	00	90	00	00	00	00	00	00	00	00	00	00	00	00							
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CX 0030 DX 0000		FFI FFI			S 1				19F5 19F5				+4	012 000		OF O	DF O	1F 1	SF 0	21	AF O	PF 1	CI
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CMD >												- 1	1			0	1	2	3	4	5	6	-
												-1		000	90	CD	20	$\mathbf{F}\mathbf{F}$	9F	00	ΕA	FΘ	FI
911B A3	0501			M	υV		[010	951,	,AX				DS	:000	98	ΑD	DΕ	1B	05	C5	06	00	00
911E 89	EC				ΟV		SP,I	BP						:00:		18	01	10	01	18	01	92	0
9120 SD				Pt	ΟP	1	BP					_	DS	:00:	18	01	01	01	90	02	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	\mathbf{F}
9121 CZ	0Z00			$_{ m RI}$	\mathbf{ET}		∞	90Z				- 1	DS:	:000	20	$\mathbf{F}\mathbf{F}$	F						
0124 A1				M	ΟŲ	- 1	AΧ,Ι	[010	931			- 1	DS	:000	28	$\mathbf{F}\mathbf{F}$	$_{\mathrm{FF}}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{E}\mathbf{B}$	19	CO	1:
0127 50					JSH		AΧ					- 1	_	:000		ΑZ	01	14	00	18	∞	F5	19
0128 E8					ALL	-	9107	7				- 1	DS	:000	38	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	99	∞	00	0
01ZB B8	004C			M	ΟŲ	- 1	AΧ,	4C00	Э			- 1	DS	:00	40	05	∞	Θ	00	90	∞	∞	Ø
O1ZE CD	21			I	T		21						DS	:00	1 8	00	00	00	00	00	00	00	00
2	0	1	2	3	4	5	6	7	8	9	A	В	С	D	Е	F	П						
DS:0000	CD	20	$\mathbf{F}\mathbf{F}$	9F	99	ΕA	FΘ	FE	AD	DE	1B	05	C5	06	00	00	ı I	- :	f.Ω≡		i I	+.	
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	02	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	- 1		f	Ŧ.			
DS:0020	FF	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	FF	EB	19	CO	11						δ	١.
DS:0030	AZ	01	14	00	18	Θ	F5	19	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	FF	∞	$\Theta\Theta$	00	00		ó		J.			
DS:0040	05	00	00	00	90	9 0	00	00	00	00	90	00	00	00	00	9 0							
1 Step	ZP	roc	Ste	3	Ret	rie	ve 4	He	lp ON	5 i	BRK	Men	nu (5		7	ιp	8	dn	9	le i	[0]	ri



	DOSE	Зох	0.7	4-3,	Ср	u sp	eed	d:	3000	cyc	les,	Fra	ime	skip	0,	Pro	ogra	am:	ı	AFC) –	(×
AX 000F	SI	000	90	C	1	9 F 5		IP 6	121		Sta	ack	+0	012	2B	Fla	ags	72	94				
BX 0005	DI	000			3 19								+2	000									
CX 0030	BP	000	-		1			IS 1					+4	000		OF	DF		SF	ΖF	ΑF	PF	CF
DX 0000	SP	FFI	Ĥ	25	1	9F5	1	5 1	.9F5				+6	200	CD.	0	0	1	Θ	0	0	1	Θ
CMD >												Т	1			0	1	2	3	4	5	6	7
												-		000	90	CD	20	$\mathbf{F}\mathbf{F}$	9F	00	ΕA	FΘ	FE
0120 SD				PO	DΡ]	BP					- 1	DS	:000	98	ΑD	DΕ	1B	05	C 5	06	00	00
0121 CZ	9200			RI	T		_	90Z					DS	:001	LO	18	01	10	01	18	01	92	01
0124 A10	9301				JŲ	ſ	ìχ,I	010	31				DS	:00:	18	01	01	01	90	02	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$
0127 50					JSH		ìΧ							:000		$\mathbf{F}\mathbf{F}$							
0128 E81					ìLL		9107					- 1		: 000	_	FF	FF	$\mathbf{F}\mathbf{F}$	FF	EB	19	C0	11
	904C				JŲ			1000)					:003	_	AΖ	01	14	00	18	9 0	F5	19
01ZE CD	21				T		21							:003		$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	90	99	60	90
0130 07				PO			ES							:00		05	99	99	00	90	99	00	
0131 8B	5702			M	JV]	DX,I	BX+	021				DS	:004	18	90	00	99	00	90	00	99	90
2	0	1	2	3	4	5	6	7	8	9	A	В	С	D	Е	F	П						
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DS:0020	$\mathbf{F}\mathbf{F}$	FF	$\mathbf{F}\mathbf{F}$	$\mathbf{F}\mathbf{F}$	EB	19	CO	11	-1					δ	٠٤.								
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DS:0040	05	00	00	00	00	00	00	00	90	00	90	00	00	00	00	00							
1 Step	2P	roc	Ste	3	Reti	rie	ve 4	Hel	p ON	5	BRK	Men	nu (6		7 (ιp	8	dn	9	le i	[0]	ci

