

DIVIDE
FIX

2

DIVIDE

BMATHD

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LOC OBJ CODE M STMT SOURCE STATEMENT

ASM 5.0

283 *H DIVIDE

284 ;

285 ;

286 ; FLOATING POINT DIVIDE ROUTINE

287 ; PRODUCES ROUNDED RESULT

288 ; INPUT: IX POINTS TO DIVIDEND

289 ; IY POINTS TO DIVISOR

290 ; OUTPUT: IX POINTS TO QUOTIENT

291 ; ERRORS: DIVISOR IS ZERO

292 ; EXPONENT OVERFLOW OR UNDERFLOW

293 ; REGISTER ASSIGNMENT FOR MAIN LOOP:

294 ; AHL - 24 BIT ACCUM, INIT DIVIDEND

295 ; CDE - 24 BIT DIVISOR

296 ; D'E'H'L' - RESULT REGISTER

297 ; B - LOOP COUNTER

298 ; A' - BIT 7 IS SIGN OF RESULT

299 ; TIMING: APPROX 3595 (3022 INNER LOOP)

300 ;

301 ;;

302 ;

303 ; CHECK FOR ZERO OPERANDS

304 ;

0140 AF 305 DIVI XOR A
0141 FD8E03 306 CP (IY+3)
0144 CAE501 R 307 JP Z,DIV0 ; Y IS ZERO
0147 DD8E03 308 CP (IX+3)
014A CA8504 R 309 JP Z,ZERO ; X IS ZERO

310 ;

311 ; LOAD OPERANDS, CALCULATE SIGN

312 ;

0140 DD4600 313 LD B,(IX) ; LOAD X INTO BHL
0150 DD6601 314 LD H,(IX+1)
0153 DD6E02 315 LD L,(IX+2)
0156 78 316 LD A,B ; GET SIGN IN A
0157 CDCC01 R 317 CALL LOADY ; LOAD Y INTO CDE
015A 08 318 EX AF,AF' ; SIGN BIT IN A'
015B 78 319 LD A,B ; X IN AHL
015C F680 320 OR 80H ; RESTORE IMPLIED 1
015E 061A 321 LD B,26 ; LOOP COUNTER
0160 C37701 R 322 JF DVSUB

323 ;

324 ; MAIN DIVIDE LOOP

325 ; PRODUCES 26 BIT RESULT IN (BIT 0 OF)D'E'H'L'CY

326 ;

0163 A7 327 DV0V AND A
0164 ED52 328 SBC HL,DE ; SUBTRACT DIVISOR

*MISSING
INSTR*

0166	99	329	SBC	A,C	
0167	37	330	OVRES1	SCF	: SET CARRY
0168	05	331	DEC	B	: DEC LOOP COUNTER
0169	2816	332	JR	Z,DVNORM	: LOOP DONE
016B	D9	333	DVLOOP	EXX	: ALT BANK
016C	ED4A	334	ADC	HL,HL	: SHIFT RESULT INTO D'E'H'L'
016E	CB13	335	RL	E	
0170	CB12	336	RL	D	
0172	D9	337	EXX		: MAIN BANK
0173	29	338	ADD	HL,HL	: SHIFT ACCUM LEFT
0174	8F	339	ADC	A,A	

WRONG!

0175	38EC	340	JR	C,DV0V	: OVERFLOW ON SHIFT
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0177	ED52		341	DVSUB	SBC HL,DE	; SUBTRACT DIVISOR
0179	99		342		SBC A,C	
017A	30EB		343		JR NC,DVRES1	; POSITIVE RESULT
017C	19		344		ADD HL,DE	; RESTORE ACCUM
017D	89		345		ADC A,C	
017E	A7		346		AND A	; TURN OFF CARRY
017F	10EA		347		DJNZ DVLOOP	; LOOP NOT DONE
			348			
			349			; NORMALIZE RESULT
			350			
0181	D9		351	DVNORM	EXX	; ALT BANK
0182	0600		352		LD B,0	; CLEAR SHIFT COUNT
0184	7B		353		LD A,E	; RESULT NOW IN D'AH'L'
0185	0B42		354		BIT 0,0	; CHECK FIRST RESULT BIT
0187	28Q7		355		JR Z,DROUND	; MSBIT IS ZERO
0189	04		356		INC B	; INC SHIFT COUNT
018A	37		357		SCF	; SHIFT RESULT RIGHT
018B	1F		358		RRA	
018C	0B1C		359		RR H	
018E	0B1D		360		RR L	; ROUNDING BIT IN CY
0190	CDA801	R	361	DROUND	CALL RSTO	; ROUND AND STORE FRACTION
			362			
			363			; SUBTRACT EXPONENTS
			364			
0193	91		365		SUB C	
0194	C32901	R	366		JP MCHK	
			367			

368 : RECIPROCAL

369 ;

0197 CD8503 R 370 REC CALL ST01 ; SAVE X

019A 210304 R 371 LD HL,C1

019D CD9D03 R 372 CALL LD ; GET A 1

01A0 FD21CF04 R 373 LD IY,TEMP1

01A4 CD4001 R 374 CALL DIVI

01A7 C9 375 RET

LOC OBJ CODE M STMT SOURCE STATEMENT

ASM 5.0

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376 *H MULT, DIVI UTILITIES
377 ;
378 ; RSTO ROUND, STORE FRACTION, LOAD EXPONENTS
379 ; INPUT: ROUNDING BIT IN CARRY
380 ; NORMALIZED FRACTION IN AHL
381 ; FINAL SIGN BIT IN A'
382 ; OUTPUT: UPDATED SHIFT COUNT IN B
383 ; UNBIASED EXP'S IN A AND C
384 ; TIMING: APPROX 186
385 ;
01A8 110000 386 RSTO LD DE,0
01AB ED5A 387 ADC HL,DE ; ADD ROUNDING BIT
01AD CE00 388 ADC A,0
01AF 3001 389 JR NC,$+3 ; NO OVERFLOW
01B1 04 390 INC B ; INC SHIFT COUNT
391 ; NOTE: DUE TO IMPLIED 1, ACTUAL SHIFTING UNNECESSARY
01B2 DD7401 392 LD (IX+1),H ; STORE FRACTION
01B5 DD7502 393 LD (IX+2),L
01B8 E67F 394 AND 7FH ; TURN OFF IMPLIED 1
01BA 67 395 LD H,A ; SAVE REST OF BYTE
01BB 08 396 EX AF,AF' ; GET FINAL SIGN
01BC B4 397 OR H ; COMBINE
01BD DD7700 398 LD (IX),A ; STORE MSBYTE
01C0 FD7E03 399 LD A,(IY+3) ; GET EXP
01C3 D680 400 SUB 80H ; REMOVE BIAS
01C5 4F 401 LD C,A
01C6 DD7E03 402 LD A,(IX+3) ; GET OTHER EXP

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01C9	D680		403	SUB	80H		: REMOVE BIAS
01CB	C9		404	RET			
			405	:			
			406	:	LOADY	LOADS FRACTION PART OF (IY) INTO CDE	
			407	:	INPUT:	MSBYTE OF X IN A	
			408	:	OUTPUT:	SIGN OF RESULT IN BIT 7 OF A	
			409	:	TIMING:	86	
			410	:			
01CC	FD4E00		411	LOADY	LD	C,(IY)	: LOAD FRACTION
01CF	FD5601		412		LD	D,(IY+1)	
01D2	FD5E02		413		LD	E,(IY+2)	
01D5	A9		414	XOR	C		: CALC SIGN BIT
01D6	E680		415	AND	80H		
01D8	CBF8		416	SET	7,C		: RESTORE IMPLIED 1
01DA	C9		417	RET			
			418	:			
			419	:	OVER OR UNDERFLOW ERRORS		
			420	:			
01DB	F2B804	R	421	MERR	JP	P,UNDER	: UNDERFLOW
01DE	D8		422	EX	AF,AF'		: GET SIGN
01DF	DD7700		423	LD	(IX),A		: SET SIGN OF RESULT
01E2	C3B304	R	424	JP	OVER		
			425	:			
			426	:	DIVISION BY ZERO ERROR		
			427	:			
01E5	210000	X	428	DIV0	LD	HL,ERROR	
01E8	CBE6		429	SET	4,(HL)		
01EA	C39604	R	430	JP	INF		

LOC OBJ CODE M STMT SOURCE STATEMENT

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431  *H FIX
432  ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
433  ;
434  ; FIX CONVERTS FLOATING POINT NUMBER TO
435  ;     16 BIT 2'S COMPLEMENT
436  ;     RESULT IS ROUNDED
437  ;
438  ; INPUT:  IX  PTS TO FL PT NUMBER
439  ; OUTPUT: IX  PTS TO 2'S COMP INTEGER
440  ;     HL  CONTAINS 2'S COMP INTEGER
441  ; ERRORS: OVERFLOW IF INPUT CANNOT BE REPRESENTED IN
442  ;     16 BITS.  MAX OUTPUT IS 32767, MIN IS -32768
443  ; ALGORITHM: SHIFT COUNT IS DERIVED FROM EXPONENT
444  ;     FRACTION PART IS SHIFTED RIGHT AND CONVERTED
445  ;     TO 2'S COMPLEMENT.
446  ;
447  ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
01ED  FD21C704 R 448  FIX    LD    IY,C_5
01F1  CD1B00   R 449          CALL ADD      ; ADD 1/2 TO ROUND
01F4  C00F02   R 450          CALL FIXA     ; CONVERT NUMBER
01F7  300F     451          JR    NC,FX6D ; NO OVERFLOW
452  ;
453  ; INTEGER OVERFLOW
454  ;
01F9  210000   X 455          LD    HL,ERROR
01FC  CBF6     456          SET  6,(HL)  ; FLAG OVERFLOW
01FE  21FF7F   457          LD    HL,7FFFH ; LARGEST INTEGER

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0201	DDC8007E	458		BIT 7,(IX)	
0205	2801	459		JR Z,FX60	; SIGN POSITIVE
0207	23	460		INC HL	; SMALLEST INTEGER
		461			;
		462			; STORE RESULT
		463			;
0208	DD7500	464	FX60	LD (IX),L	
0208	DD7401	465		LD (IX+1),H	
020E	C9	466		RET	
		467			;
		468			; FIXA MAIN 16 BIT FIX OPERATION
		469			; INPUT: IX PTS TO FL PT NUMBER
		470			; OUTPUT: HL IS 16 BIT 2'S COMPLEMENT
		471			; CY IS SET IF HL IS INVALID (OVERFLOW)
		472			;
020F	AF	473	FIXA	XOR A	
0210	67	474		LD H,A	; CLEAR ACCUM
0211	6F	475		LD L,A	
0212	DD8E03	476		CP (IX+3)	
0215	C8	477		RET Z	; INPUT WAS ZERO
0216	DD6600	478		LD H,(IX)	; LOAD MS 16 BITS
0219	CBFC	479		SET 7,H	; RESTORE IMPLIED 1
021B	DD6E01	480		LD L,(IX+1)	
021E	3E90	481		LD A,16+80H	
0220	DD9603	482		SUB (IX+3)	; CALC SHIFT COUNT
0223	D8	483		RET C	; X >= 2+16
0224	2813	484		JR Z,FX25	; COUNT IS ZERO
		485			;
		486			; INITIALIZE FOR LOOP
		487			;

0226

0610

488

LD B.16

; SET MAX COUNT

LOC	OBJ CODE M	STMT	SOURCE	STATEMENT	ASM 5.0
0228	B8	489	CP	B	
0229	3001	490	JR	NC,FX10	; COUNT >= 16
022B	47	491	LD	B,A	; SET COUNT
022C	AF	492	FX10	XOR A	; CLEAR A
022D	DDBE02	493	CP	(IX+2)	
0230	17	494	RLA		; A IS 1 IF (IX+2)>0
		495			;
		496			; SHIFT RIGHT UNTIL COUNT=D
		497			;
0231	CB3C	498	FX20	SRL H	
0233	CB1D	499	RR	L	
0235	CE00	500	ADC	A,0	; ACCUM BITS SHFTD OUT
0237	10F8	501	DJNZ	FX20	
		502			;
		503			; CONVERT TO 2'S COMPLEMENT
		504			;
0239	DDCB007E	505	FX25	BIT 7,(IX)	
023D	281D	506	JR	Z,FX40	; POSITIVE
023F	A7	507	AND	A	
0240	2801	508	JR	Z,FX30	; EXACT INTEGER
0242	23	509	INC	HL	
0243	EB	510	FX30	EX DE,HL	
0244	210000	511	LD	HL,0	
0247	A7	512	AND	A	
0248	ED52	513	SBC	HL,DE	; NEGATE
024A	F25302	R 514	JP	P,FX50	; OVERFLOW
024D	A7	515	AND	A	; CLEAR CY

024E	C9	516		RET		
024F	A7	517	FX40	AND	A	; CLEAR CY
0250	CB7C	518		BIT	7,H	
0252	C8	519		RET	Z	; NO OVERFLOW
		520				;
		521				; OVERFLOW
		522				;
0253	37	523	FX50	SCF		; SET CY
0254	C9	524		RET		