SY R₁,D₂(X₂,B₂)	**Subtract Fullword**				RXY-a

E3	R₁X₂	B₂DL₂	DL₂DL₂	DH₂DH₂	5B

The Subtract instruction performs 2's complement binary subtraction. Operand 1 is a register containing a fullword integer. Operand 2 specifies a fullword in memory. The fullword in memory is subtracted from the fullword in the register and the result remains in the register. The fullword in memory is not changed. Only bits 32-63 are affected by this operation. The leftmost part of the register, bits 0-31 are unchanged.

Since **SY** has an RXY-a instruction format, the second operand base/displacement address has a signed displacement size of 20 bits which supports a displacement range from -524,288 to 524,287. This is significantly larger than the 12-bit displacement of an add fullword instruction (A) which has a range from 0 – 4095.

Consider the following example,

```
SY     R9,AFIELD
```

R9 (Before)

11	22	33	44	00	00	01	23

R9 (After)

11	22	33	44	00	00	01	22

AFIELD

Memory
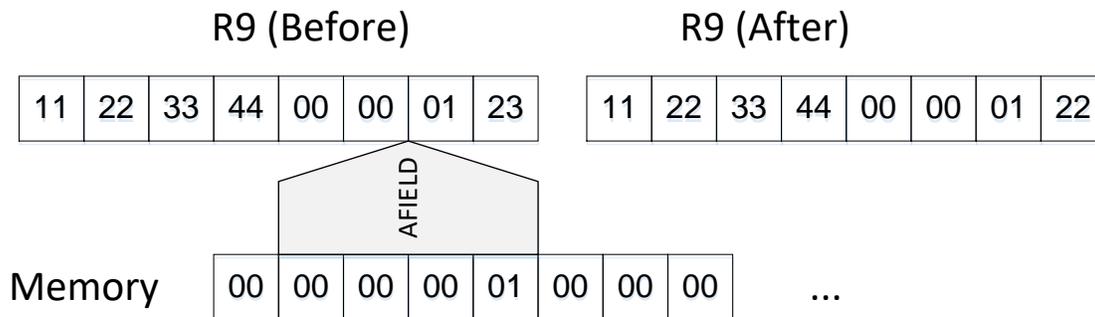
00	00	00	00	01	00	00	00	...

The contents of the fullword "AFIELD", x'00000001' = 1, are subtracted from register 9 which contains x'00000123' = 291 in decimal. The difference is 290 in decimal = x'00000122' destroying the previous value in R9. The fullword in memory is unchanged by this operation.

Since **SY** is an RXY-a instruction, an index register may be coded as part of operand 2.

SY has a two-byte opcode, E35B.

Some Unrelated Sutractss

```
R4 =  X'00000000FFFFFFD5'  -43 IN 2'S COMPLEMENT
R5 =  X'0000000000000028'  +40 IN 2'S COMPLEMENT
R6 =  X'0000000000000004'   +4 IN 2'S COMPLEMENT

DOG   DC   F'35'
CAT   DC   F'4'

SY    R4,=F'20'    R4 = X'00000000FFFFFFC1' = -63
SY    R5,=F'-20'   R5 = X'000000000000003C' = +60
SY    R6,=F'20'    R6 = X'00000000FFFFFFF0' = -16
SY    R6,=F'-5'    R6 = X'0000000000000009' = +9
SY    R6,CAT       R6 = X'0000000000000000' =  0
SY    R5,DOG       R5 = X'0000000000000005' = +5
SY    R6,DOG(R6)   R6 = X'0000000000000000'  INDEXING IS ALLOWED
```

Tips

1. You might consider using **SY** instead of S in cases where you have maxed out a base register. Rather than adding another base register to fix an addressability error, consider using **SY** to help solve your problem.

2. Many RX instructions have companions in the RXY-a instruction class. RXY-a instructions all provide 20-bit displacements (range 0 - 1,048,575) compared to the 12-bit displacements (range 0 – 4095) of RX instructions. For example, AY is the companion Add Fullword instruction A.