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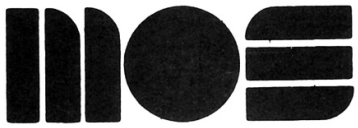

SIMPLIFYING CONVERSION FROM THE MOTOROLA MC6800 MICROPROCESSOR TO THE MOS TECHNOLOGY, INC. MCS6501

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Because of the pin capability between the MOS TECHNOLOGY, INC. MCS6501 and the Motorola MC6800, converting a system from the MC6800 to the MOS TECHNOLOGY, INC. Microprocessor is a fairly simple matter. In fact, several MCS6501 customers have suggested that it would be possible to completely debug their system hardware using the MC6800. Re-programming would then allow them to take advantage of the lower price and architectural superiority of the MCS6501 when this device becomes available in quantity.

This paper outlines the similarities and differences between these two microprocessor instruction sets and discusses procedures which, if adhered to during system implementation, will allow conversion to the MCS6501 with an absolute minimum of difficulty.

Table 1 lists those instructions which are exactly the same in both the MCS6501 and the MC6800. Note that these instructions apply strictly to accumulator A since the MCS6501 contains but a single accumulator.

Table 2 lists those instructions in the MC6800 set which have no direct replacement in the MCS6501. Note that some instructions can be replaced by a pair of instructions or by a somewhat different operation.

The indexing operation is the one area which requires the most attention in the conversion. The MCS6501 is capable of "true indexing", i.e., specification of a base address in the instruction with the offset being held in the index register.

Because Motorola chose to reverse this procedure, their index register is less useful as an index register than it is for register-indirect addressing. This is accomplished in the MC6800 Assembler as shown in the following example:

```
STA 0,  X
```

This operation has no direct equivalent in the MCS6501 and should be avoided in this form. This operation can be converted quite readily, however, if labels are used as follows:

```
LABL1   EQU   0
        LDX   #LABL2
         .
         .
         .
         .
        STA   LABL1, X
```

Conversion is then accomplished in a straightforward manner by re-defining LABL1 and LABL2.

It should be noted that although the rules listed above will simplify conversion to the MCS6501, it is certainly true that the MCS6501 contains several very powerful architectural features (index registers, indirect addressing modes, etc.) which one may wish to take advantage of when the software conversion is implemented. This will, in fact, complicate the conversion process but will yield a system which operates faster while requiring less program storage than the equivalent MC6800 system.

ADC	DEX
AND	EOR
ASL	INC
ASR	INX
BCC	JMP
BCS	JSR
BEQ	LDA
BIT*	LSR
BMI	NOP
BNE	ORA
BPL	PSH
BVC	PUL
BVS	ROL
CLC	RTI
CLI	RTS
CLV	SBC
CMP	SEC
DEC	SEI
	STA

ALL WITH ACCUMULATOR A ONLY

* V and N have different results

Table 1

Motorola Instructions Directly Compatible With MCS6501

MC6800 Instruction	Utilization of Instruction in MCS6501
ABA	No replacement
ADD	May be done with CLC, ADC
BGE, BGT, BHI, BLE, BLS, BLT	No direct replacement. If you are using signed numbers, use combinations of the other branches.
BRA	JMP
CBA	No replacement
COM	May be done with EOR #FF
DAA	Replaced by SED (Set Decimal Mode)
DES	No direct replacement
INS	No direct replacement
LDS	Replace with LDX, TXS
NEG	Subtract from all zeros
ROR	Transfer C into bit 7 after LSR using ORA #80
SBA	No replacement
SEV	No replacement
STS	Do with TSX, STX
SUB	Do with SEC, SBC
SWI	BRK does same thing without going to special addr
TAB	No replacement
TAP	No direct replacement
TBA	No replacement
TPA	No direct replacement
TST	BIT accomplishes the same functions
WAI	No replacement

Table 2

MC6800 Instructions Which Are Not Directly Compatible With The MCS6501

NOTE:

INSERT THE FOLLOWING INSTRUCTIONS ABOVE "ADD LDA SA" :

```
SUB LDA SB
    EOR #$80
    STA SB
ADD LDA SA
```