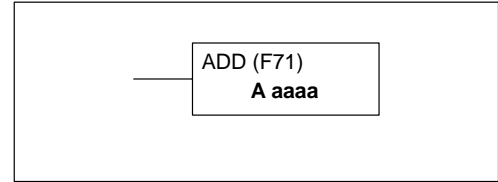


## Math Instructions

**Add**  
**ADD (F71)**

The Add (F71) is a 16-bit instruction that adds the value of a 16 bit reference, two consecutive 8-bit registers (specify starting location), or a 4-digit BCD value with the value in the accumulator. The result resides in the accumulator. Discrete bit flags are used to indicate if the result had a carry digit or if the result was zero.

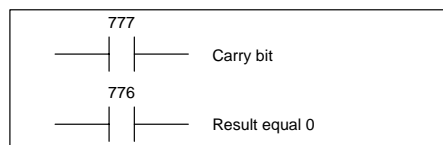
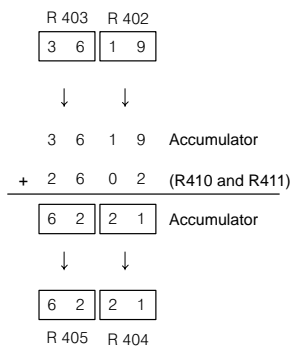
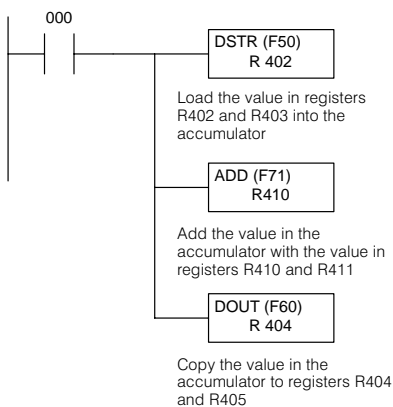


Data Type		D3–330 Range	D3–340 Range	D3–330P Range
A		aaaa	aaaa	aaaa
Inputs / Outputs	R	000–014 070–075	000–014 070–075	000–014 070–075
Control Relays	R	016–036	016–036 100–105	016, 020–027
Shift Registers	R	040–056	040–056	—
Stages	R	—	—	100–116
Timer /Counters (16 bit)	R	600–677	600–677	600–677
Data Registers	R	400–577	400–577 700–777	400–577
Constant (4–digit BCD)	K	0000–9999	0000–9999	0000–9999

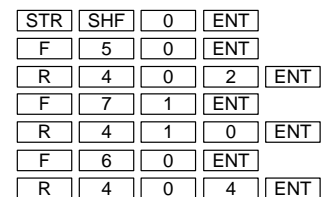
Discrete Bit Flags	Description
775	Will be on if the operation results in a carry
776	Will be on if the result is 0

In the following example, when input 000 is on the value (3619) in R402 and R403 is loaded into the accumulator using the Data Store (F50) instruction. The Add instruction (F71) adds the value (2602) in R410 and R411 to the value in the accumulator. The result in the accumulator is then copied to data registers R404 and R405 with the Data Out (F60) instruction.

## DirectSOFT Display



## Handheld Programmer Keystrokes

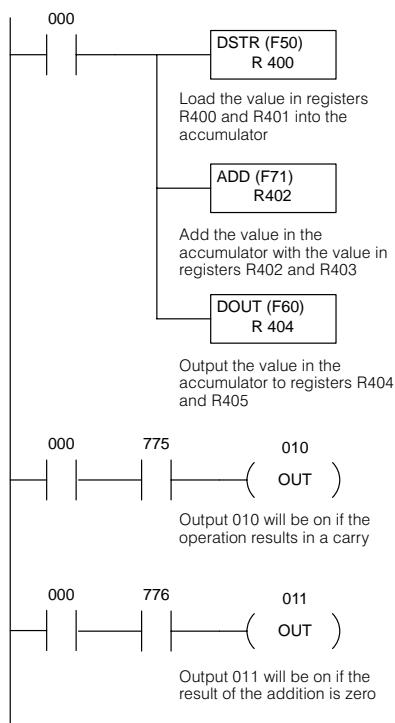


## Add Example

The following examples demonstrate how the discrete status flags are used to indicate if the result of the add has produced a number which exceeds the capacity of the accumulator. Remember, the accumulator has a 4 digit maximum. When a calculation produces a number larger than 4 digits, part of this number is lost. The following table shows different values being used in the logic example below. Notice how the discrete status flags change.

	Registers for DSTR Instruction R401/R400	Registers for ADD Instruction R403/R402	Registers for DOUT Instruction R405/R404	Discrete Status Flag 775	Discrete Status Flag 776
Example 1	500	400	0900	off	off
Example 2	5000	5000	0000	on	on
Example 3	5050	5000	0050	on	off

### DirectSOF Display



### Handheld Programmer Keystrokes

STR	SHF	0	ENT
F	5	0	ENT
R	4	0	0 ENT
F	7	1	ENT
R	4	0	2 ENT
F	6	0	ENT
R	4	0	4 ENT
STR	SHF	7	7 5 ENT
OUT	SHF	0	1 0 ENT
STR	SHF	7	7 6 ENT
OUT	SHF	0	1 1 ENT

**NOTE:** An input has been used to interlock the outputs on the last two rungs. This is done since an earlier math instruction could result in the status flag coming on when this particular math instruction is not being executed thereby providing the opportunity for an unexpected output signal.

It is a common mistake to just use the status flags without interlocking to control outputs in a program but, the status flags can change several times during the same scan. Just as you should not use the status flags by themselves to control outputs, you also should not monitor status flags within the program. Instead you should monitor the interlocked outputs controlled by the status flags.

**Subtract  
SUB (F72)**

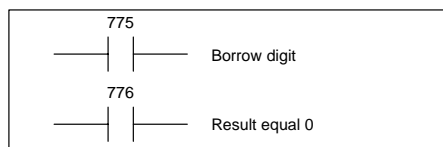
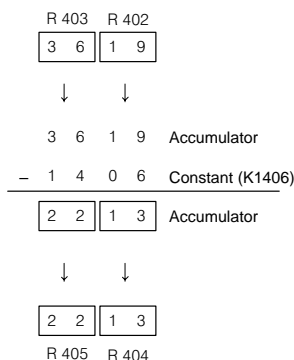
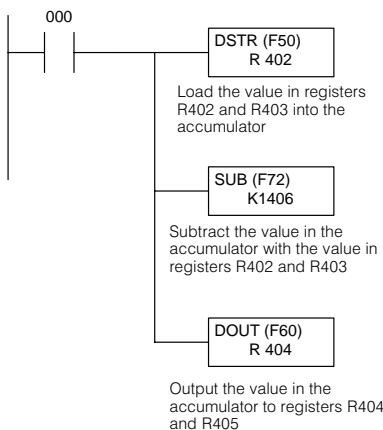
The Subtract (F72) is a 16-bit instruction that subtracts the value in a 16-bit register, two consecutive 8-bit registers (specify starting location), or a 4-digit BCD value from the value in the accumulator. The result resides in the accumulator. Discrete bit flags are used to indicate if the result had a borrow digit or the result was zero.

SUB (F72)  
A aaaa

Data Type		D3–330 Range	D3–340 Range	D3–330P Range
A		aaaa	aaaa	aaaa
Inputs / Outputs	R	000–014 070–075	000–014 070–075	000–014 070–075
Control Relays	R	016–036	016–036 100–105	016, 020–027
Shift Registers	R	040–056	040–056	—
Stages	R	—	—	100–116
Timer /Counters (16 bit)	R	600–677	600–677	600–677
Data Registers	R	400–577	400–577 700–777	400–577
Constant (4-digit BCD)	K	0000–9999	0000–9999	0000–9999

Discrete Bit Flags	Description
775	Will be on if the result if a borrow digit occurred
776	Will be on if the result is 0

In the following example, when input 000 is on the value (3619) in R402 and R403 is loaded into the accumulator using the Data Store (F50) instruction. The constant value K1406 is subtracted from the value in the accumulator using the Subtract (F72) instruction. The result in the accumulator is then copied to data registers R404 and R405 using the Data Out (F60) instruction.

**DirectSOFT Display****Handheld Programmer Keystrokes**