

Handbook of SAS® Data Step Programming

Execution Phase of Program 3.1

Arthur Li

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
																								...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		0				.		.		.	



1st Iteration:

❖ At the beginning

□ $_N_ \leftarrow 1, _ERROR_ \leftarrow 0$

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
																								...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		0				.		.		.	



1st Iteration:

❖ At the beginning

❑ $_N_ \leftarrow 1, _ERROR_ \leftarrow 0$

❑ The remaining variables are set to *missing*

Execution Phase of Program 3.1

```
data ex3_1;  
  ➔ infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
																								...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		0				.		.		.	

1st Iteration:

❖ The INFILE statement identifies the location of Example1.txt

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
    BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		0				.		.		.	

1st Iteration:

- ❖ The INPUT statement copies the 1st data line into the input buffer

Execution Phase of Program 3.1

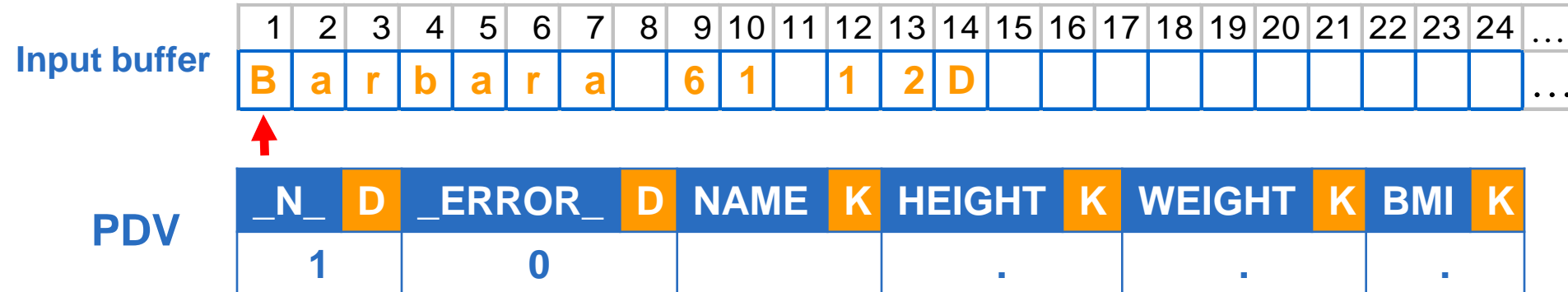
```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
    BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175



1st Iteration:

- ❖ The input pointer positions at the beginning of the input buffer

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
    BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
	B	a	r	b	a	r	a		6	1		1	2	D											...
PDV																									
	N D		_ERROR_ D		NAME K		HEIGHT K		WEIGHT K		BMI K														
	1		0				.		.		.														

1st Iteration:

❖ The INPUT statement reads data values: input buffer → PDV

Execution Phase of Program 3.1

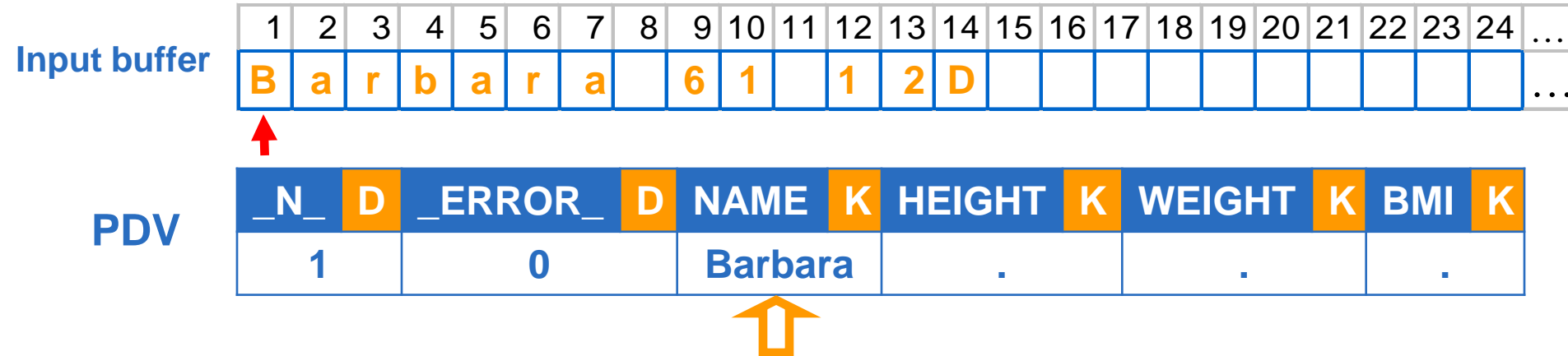
```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
    BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175



1st Iteration:

❖ input buffer (columns 1-7) → “Name” in the PDV

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
    BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...



PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		0		Barbara		.		.		.	

1st Iteration:

❖ The input pointer @ column 8

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
    BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...



PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		0		Barbara		61		.		.	



1st Iteration:

❖ input buffer (columns 9-10) → “Height” in the PDV

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...



PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		0		Barbara		61		.		.	

1st Iteration:

❖ The input pointer @ column 11

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...



PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		0		Barbara		61		.		.	



1st Iteration:

❖ Tries to read Weight – invalid value

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...



PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		1		Barbara		61		.		.	



1st Iteration:

- ❖ Tries to read Weight – invalid value
- ❖ $_ERROR_ \leftarrow 1$

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  ➔ input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...



PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		1		Barbara		61		.		.	

1st Iteration:

❖ The input pointer @ column 15

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  ➔ BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		1		Barbara		61		.		.	



1st Iteration:

- ❖ BMI will remain missing:
operations on a missing value → a missing value

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  ➡ output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		1		Barbara		61		.		.	

1st Iteration:

- ❖ OUTPUT statement is executed
- ❖ Only values marked with (K) are copied as a single observation to the SAS dataset ex1

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.

Execution Phase of Program 3.1

```
data ex3_1;
  infile 'W:\SAS Book\dat\example3_1.txt';
  input name $ 1-7 height 9-10 weight 12-14;
  BMI = 700*weight/(height*height);
  output;
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		1		Barbara		61		.		.	

1st Iteration:

❖ At the end of the DATA step, two things occur automatically:

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.

Execution Phase of Program 3.1

```
data ex3_1;
  infile 'W:\SAS Book\dat\example3_1.txt';
  input name $ 1-7 height 9-10 weight 12-14;
  BMI = 700*weight/(height*height);
  output;
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
1		1		Barbara		61		.		.	

1. The SAS system returns to the beginning of the DATA step

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
B	a	r	b	a	r	a		6	1		1	2	D											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
2		0				.		.		.	



2. The values of the variables in the PDV are reset to *missing*

$_N_ \uparrow 2$

$_ERROR_ \leftarrow 0$

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.

Execution Phase of Program 3.1

```
data ex3_1;
  infile 'W:\SAS Book\dat\example3_1.txt';
  ➔ input name $ 1-7 height 9-10 weight 12-14;
  BMI = 700*weight/(height*height);
  output;
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
J	o	h	n					6	2		1	7	5											...

↑

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
2		0				.		.		.	

2nd Iteration:

- ❖ 2nd data line → input buffer
- ❖ The input pointer @ beginning of the input buffer

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.

Execution Phase of Program 3.1

```
data ex3_1;
  infile 'W:\SAS Book\dat\example3_1.txt';
  ➔ input name $ 1-7 height 9-10 weight 12-14;
  BMI = 700*weight/(height*height);
  output;
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
J	o	h	n					6	2		1	7	5											...

PDV

N D	_ERROR_ D	NAME K	HEIGHT K	WEIGHT K	BMI K
2	0	John	62	175	.

2nd Iteration:

❖ The INPUT statement:
input buffer → PDV

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  ➔ BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
J	o	h	n					6	2		1	7	5											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
2		0		John		62		175		31.868	

2nd Iteration:

❖ BMI is calculated

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.

Execution Phase of Program 3.1

```
data ex3_1;
  infile 'W:\SAS Book\dat\example3_1.txt';
  input name $ 1-7 height 9-10 weight 12-14;
  BMI = 700*weight/(height*height);
  ➔ output;
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
J	o	h	n					6	2		1	7	5											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
2		0		John		62		175		31.868	

2nd Iteration:

❖ The OUTPUT statement is executed

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.
2	John	62	175	31.868

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
J	o	h	n					6	2		1	7	5											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
2		0		John		62		175		31.868	

2nd Iteration:

❖ At the end of the DATA step, two things occur automatically:

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.
2	John	62	175	31.868

Execution Phase of Program 3.1

```
data ex3_1;
  infile 'W:\SAS Book\dat\example3_1.txt';
  input name $ 1-7 height 9-10 weight 12-14;
  BMI = 700*weight/(height*height);
  output;
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
J	o	h	n					6	2		1	7	5											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
2		0		John		62		175		31.868	

1. The SAS system returns to the beginning of the DATA step

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.
2	John	62	175	31.868

Execution Phase of Program 3.1

```
data ex3_1;
  infile 'W:\SAS Book\dat\example3_1.txt';
  input name $ 1-7 height 9-10 weight 12-14;
  BMI = 700*weight/(height*height);
  output;
run;
```

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

Input buffer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	...
J	o	h	n					6	2		1	7	5											...

PDV

N	D	_ERROR_	D	NAME	K	HEIGHT	K	WEIGHT	K	BMI	K
3		0				.		.		.	



2. The values of the variables in the PDV are reset to *missing*
 N ↑ 3

Ex3_1:

	Name	Height	Weight	BMI
1	Barbara	61	.	.
2	John	62	175	31.868

Execution Phase of Program 3.1

```
data ex3_1;  
  infile 'W:\SAS Book\dat\example3_1.txt';  
  input name $ 1-7 height 9-10 weight 12-14;  
  BMI = 700*weight/(height*height);  
  output;  
run;  
→ proc print data=ex3_1;  
run;
```

The end-of-
file marker

Example3_1.txt

12345678901234567890

Barbara 61 12D

John 62 175

- ❖ SAS attempts to read an observation from the input data set, but it reaches the end-of-file-marker, which means that there are no more observations to read
- ❖ The SAS system → next DATA/PROC step