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[Title] Specific Examples of Year 2000 Problems and Examples of Measures for MELSEC-A/QnA/Q Series CPU Module

[Date of Issue] November 99

[Relevant Models] All MELSEC-A/QnA/Q Series CPU Modules

Thank you for your continued patronage of the Mitsubishi PLC MELSEC-A/QnA/Q Series.

Measures for the year 2000 problem with the MELSEC-A/QnA/Q Series PLC CPU module have been previously explained with the Technical Bulletins T04-0007, T99-0013, and T40-0001. Specific examples of problems and measures to be taken are introduced in this Technical Bulletin.
Due to the complexity of the application programs and system, there are a variety of situations in which the actual problems could occur. Thus, the details and circuit examples given in this Technical Bulletin are for reference, and do not guarantee operation. The user is asked to carry out sufficient testing and verification before actual use.

Whereas

[Details]

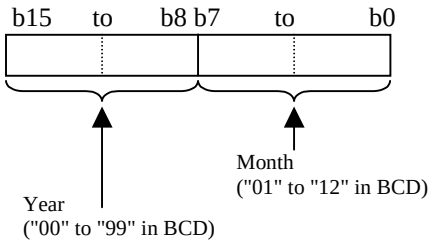
1. Outline

Measures for the PLC CPU year 2000 problem have been introduced in the MELSEC-A/QnA Series Technical Bulletin T04-0007, the MELSEC-Q Series Technical Bulletin T40-0001 and data book. The MELSEC-A Series CPU, QnA Series Q Series A mode CPU all have an internal clock, the year data is handled with the last two digits, so depending on the details of the application program, a problem could occur.
This Technical Bulletin explains specific examples of the problems and examples of measures to be taken.

2. PLC CPU clock data storage device

The clock data's year and month data storage device is used to explain specific examples of the sequence program. The details of the actual storage device are shown below.

[Clock data storage device]

Device No.	Name	Details
D9025 (A Series CPU having clock, excluding A2CCPUC24-(PRF) and A52GCPU (T21B) (Q Series A mode CPU) D9073 (A2CCPUC24-(PRF)) and A52GCPU (T21B) SD210 (QnA Series CPU) SD1025 (QnA Series CPU)	Clock data (Year, month)	

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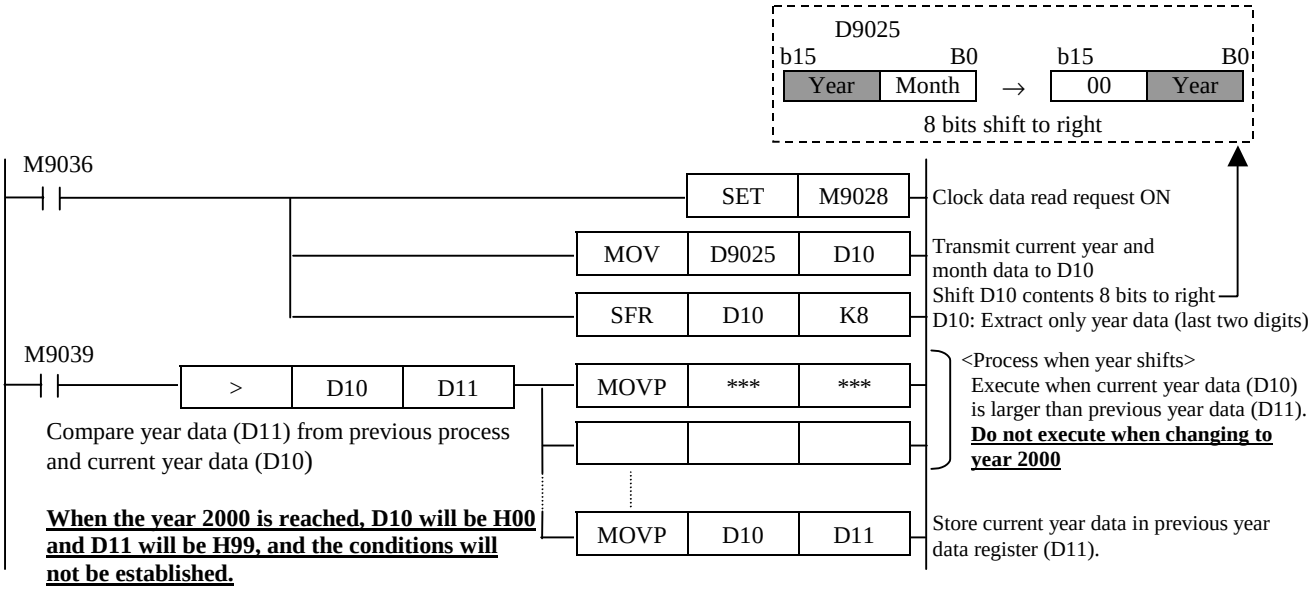
With the following models, there are some commands that use the clock data. If these commands are in use, the same measures must be taken.
Refer to the Programming Manual for details.

CPU unit	Commands handling clock data
AnACPU AnUCPU A2USCPU (-S1) A2USHCPU-S1 A7BD-A3A-* A80BD-A2USH-S1	• DATERD/DATEWR command
A mode CPU of MELSEC-Q	
QnACPU Q4ARCPU Q2ASCPU (-S1) Q2ASHCPU (-S1)	• DATERD/DATEWR command • REQ command • Clock data at the time of SEND/RECV/READ/SREAD/WRITE/SWRITE/REQ/ZNFR/ZNTO command error

3. Examples of problems and measures

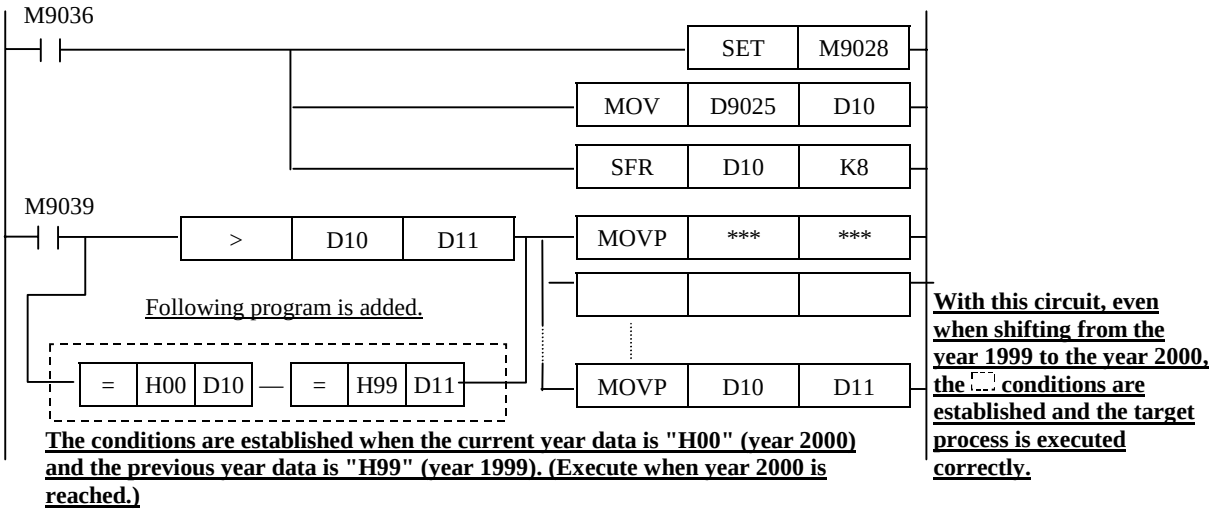
(Example 1) When a process is attempted at the instant the year changes:
The following example gives the problems that occur and measures to be taken if a process is attempted only once when the year changes. In actual use, this process may not be carried out in many cases. However, since the PLC's year data uses the last two digits, the problems that could occur and the measures to be taken are introduced.
(It is assumed that the clock data storage device is an A Series CPU excluding the A2CCPUC24 (-PRF) and A52GCPU (T21B).)

1) Example of circuit with which correct processing is not carried out for year 2000



*** With this circuit, since the year data is two digits when shifting from the year 1999 to the year 2000, the size comparison conditions will not be established, and the target process will not be executed.**

2) Example of circuit revised so process is carried out correctly in year 2000 (program is added)



(Note) With the above circuit example, it is presumed that D10 and D11 are latch-designated, and the current year data is set in the previous year data D11 through initialization by another circuit.

(Example 2) In a system that logs the annual production amount in the PLC register together with the year data, to retrieve data following a designated year

1) Example in which problem occurs because year data is handled with two digits

(The clock data storage device is for the A Series CPU, excluding A2CCPU24(-PRF) and A52GCPU(T21B).)

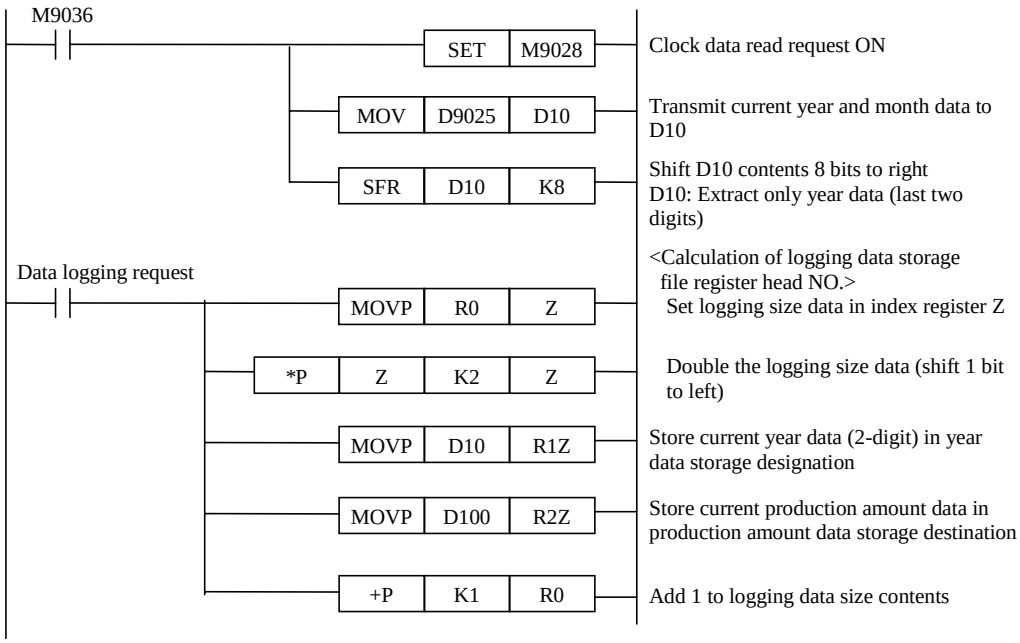
An example of the data logging table assignment and data storage, and an example of a logging circuit are shown below.

<Data logging table>

R0	H0007	Logging data size: 7 cases	
R1	H0096	Year 1996	1st case
R2	H1500	(H1500 pieces)	
R3	H0097	Year 1997	2nd case
R4	H1857	(H1857 pieces)	
R5	H0098	Year 1998	3rd case
R6	H1623	(H1623 pieces)	
R7	H0099	Year 1999	4th case
R8	H1746	(H1746 pieces)	
R9	H0000	Year 2000	5th case
R10	H1898	(H1898 pieces)	
R11	H0001	Year 2001	6th case
R12	H1637	(H1637 pieces)	
R13	H0002	Year 2002	7th case
R14	H1531	(H1531 pieces)	
R15	H0000	No data	
R16	H0000	No data	
R17	H0000	No data	
R18	H0000	No data	

Data logging table specifications

- The No. of logged data cases is stored in the head R0.
- The year data of the logging is stored as a BCD code in the odd No. of the file register R. Specifically, the year data obtained by shifting the contents of the clock data D9025 (year/month) 8 bits to the right is stored. (For the year 1996, H0096 is stored.)
- The annual production amount is stored in the even No. of the file register R.
- In the example on the left, seven cases of data from the year 1996 to 2002 are stored.

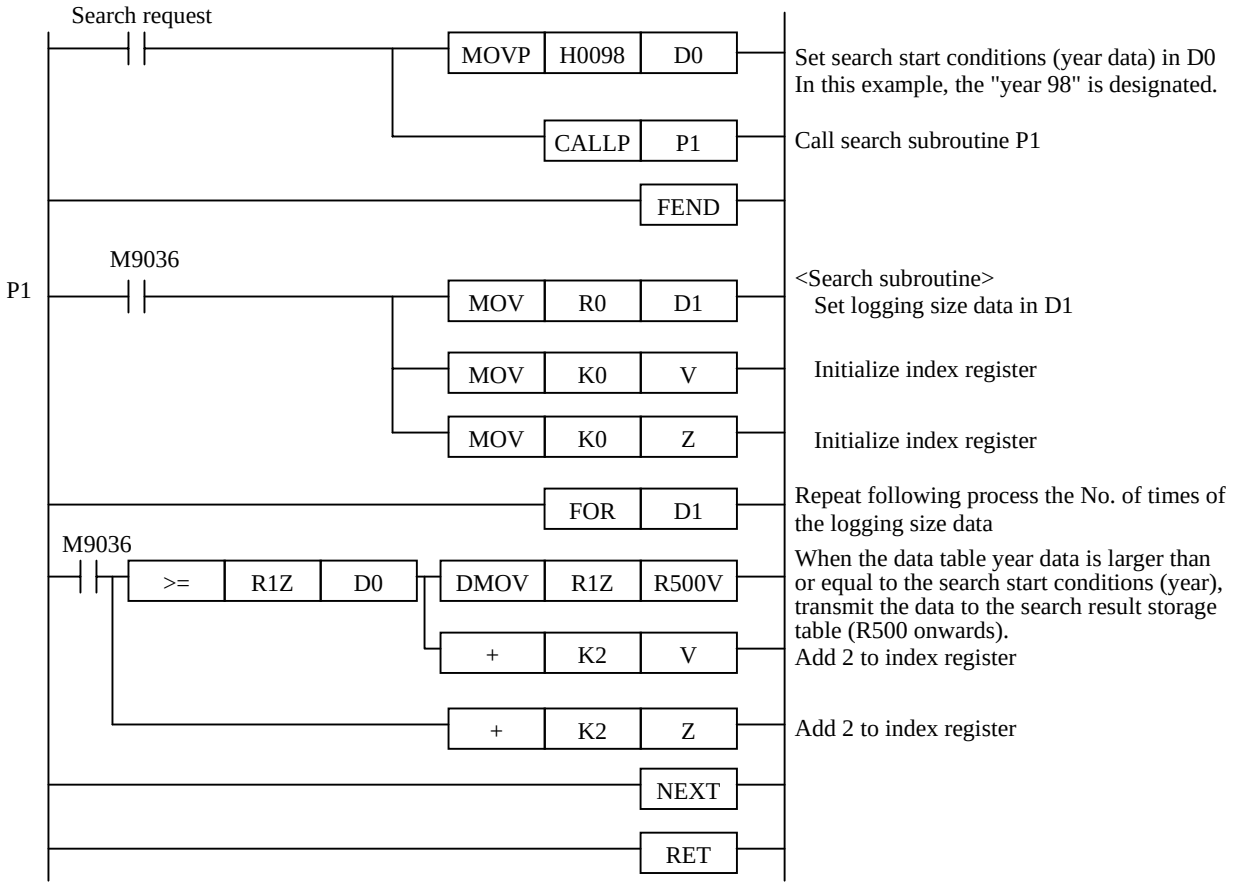


(Note) It is presumed that the production amount data of data logging operation is already stored in D100.
It is presumed that "0" is initially stored in R0.

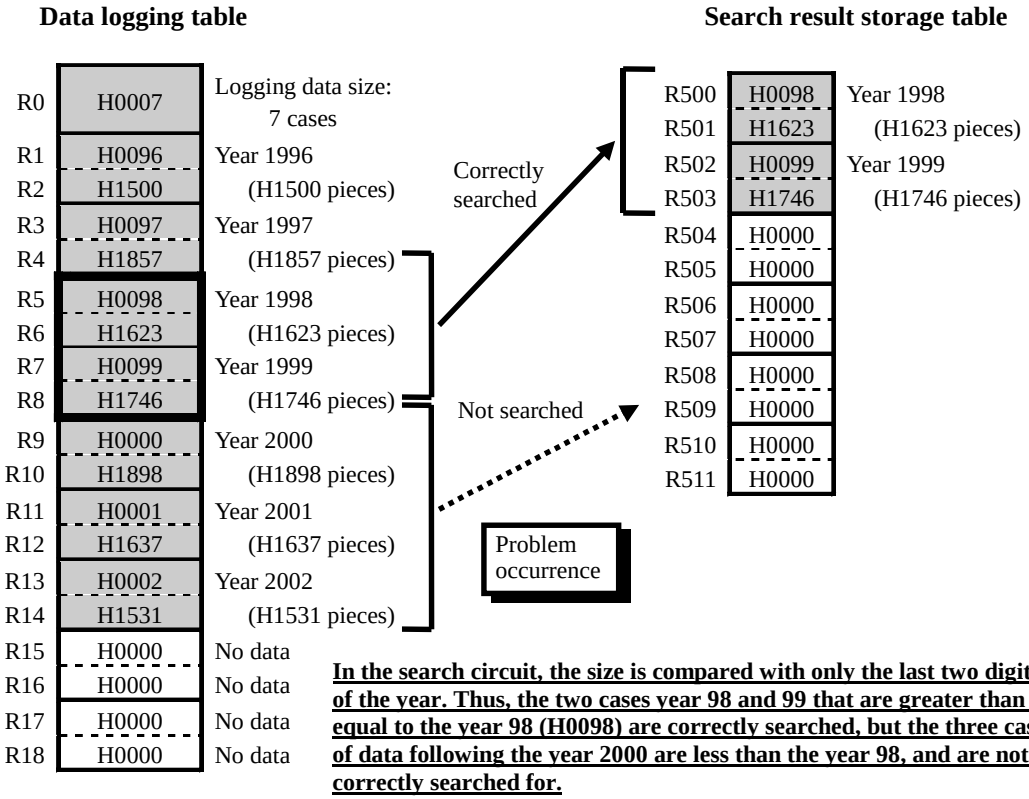
<Example of data search circuit>

An example for searching the previous data logging table contents with designated conditions and retrieving data is given. The search results are stored in the search result storage table (R500 onwards).

In this circuit example, data following the year 1998 is retrieved.



The state of a problem resulting from searching data following the year 1998 is shown below.



In the search circuit, the size is compared with only the last two digits of the year. Thus, the two cases year 98 and 99 that are greater than or equal to the year 98 (H0098) are correctly searched, but the three cases of data following the year 2000 are less than the year 98, and are not correctly searched for.

2) Example of taking measures for previous problem by increasing year data to four digits

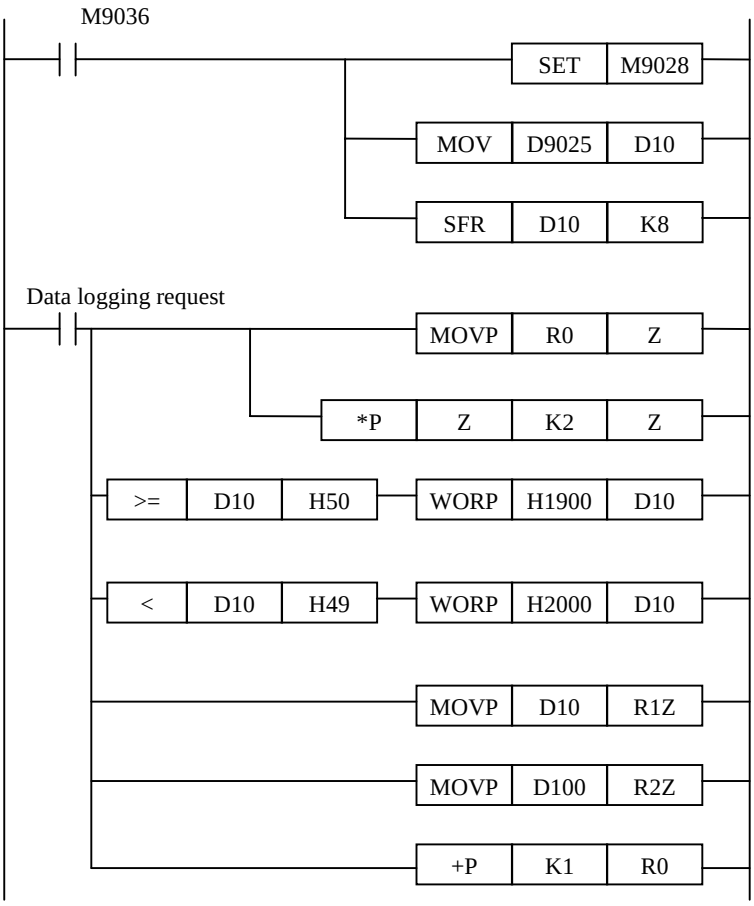
The problem occurs because the year data is handled with the last two digits. Thus, if the year data is increased to four digits, the problem will not occur. Examples of the data logging table and data logging circuit modified to handle the year data with four digits are shown below.

<Data logging table>

R0	H0007	Logging data size: 7 cases	
R1	H1996	Year 1996	1st case
R2	H1500	(H1500 pieces)	
R3	H1997	Year 1997	2nd case
R4	H1857	(H1857 pieces)	
R5	H1998	Year 1998	3rd case
R6	H1623	(H1623 pieces)	
R7	H1999	Year 1999	4th case
R8	H1746	(H1746 pieces)	
R9	H2000	Year 2000	5th case
R10	H1898	(H1898 pieces)	
R11	H2001	Year 2001	6th case
R12	H1637	(H1637 pieces)	
R13	H2002	Year 2002	7th case
R14	H1531	(H1531 pieces)	
R15	H0000		
R16	H0000		
R17	H0000		
R18	H0000		

Data logging table specifications

- The No. of logged data cases is stored in the head R0.
- The year data of the logging is stored as a BCD code in the odd No. of the file register R.
- The annual production amount is stored in the even No. of the file register R.
- In the example on the left, seven cases of data from the year 1996 to 2002 are stored.

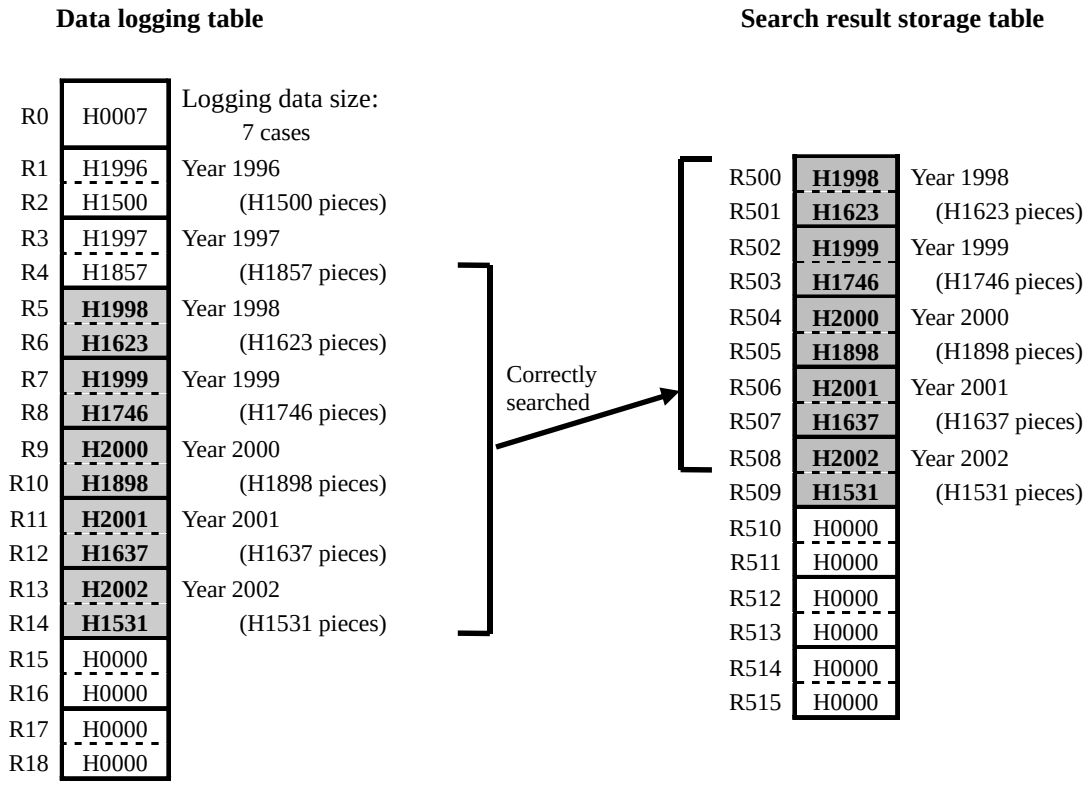


(Note) It is presumed that the production amount data at data logging is already stored in D100.

<Method for increasing year data from two digits to four digits>

The method for increasing the two-digit year data to four digits in the circuit example is as follows.

- When the two-digit year data is greater or equal to the year 50, it is interpreted as being in the 1900's, and 19 is added to the head of the year data to make four digits.
- When the two-digit year data is less than the year 49, it is interpreted as being from 2000 onwards, and 20 is added to the head of the year data to make four digits.

The results of searching the contents of the data logging table on the previous page by designating the year data 1998 as the search conditions for the data search circuit example given on page 6/9 are shown below. (The first line is changed to MOVP H1998 D0.)
As a result of the search, the data is correctly searched from the year 1998 to the year 2000.

<Search of data following the year 1998>