CEGELEC
INDUSTRIAL CONTROLS

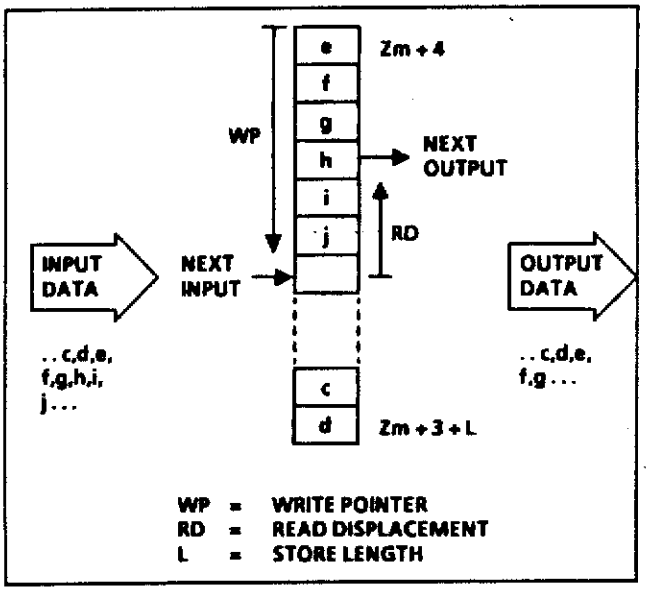
STORE Function

STORE T30

DESCRIPTION

The STORE function may be used as a first in first out store, or to time delay a variable or for history recording.

Data are input and/or output at the rate of one item per scan of the user program. The function incorporates pointers which automatically steer the incoming data into the next store location, and keep track of the output data so that it is retrieved in the same chronological order.



FEATURES

- User programmable store length.
- First in, first out store with independent WRITE and READ, and flags for FULL and EMPTY.
- Can be used to introduce a variable delay into a data stream.

SPECIFICATION

Control language:-

```
          STORE
X--------SPEC--------VALUE--------Q
          T30           Zm
       +-<   >
       |
Y------+
```

Table 1 **Program rung data**

Sym	Location	Use	Range
X	Rung input (upper branch)	Mode control input	1 WRITE only 2 READ only 3 WRITE followed by READ <1 or >3 no operation
Y	Rung input (lower branch)	Data input to store	Numeric ±32767 or logic 16 ON/OFF states
Zm	Value location	Start of parameter list (L+4) locations)	Any write enabled table usable by special functions
Q	Rung output	Data output from store	Numeric ±32767 or logic 16 ON/OFF states
		Dummy output −1 (@FFFF when no data to be output i.e. X<3 or >3	

Table 2 **Value data**

Sym	Location	Use	Range
F	Zm	Fault code and flags	See tables 3 & 4
WP	Zm+1	Write pointer	Automatically incremented after each WRITE Cycles in range 0 to (L − 1)
RD#	Zm+2	Read displacement	Automatically incremented after each WRITE and decremented after each READ LIMITED to 0 to L
L*	Zm+3	Store length	>0 limited only by available sizes of data tables
S(0)	Zm+4	First store location	Numeric ±32767 or logic 16 ON/OFF states
S(L − 1)	Zm+3+L	Last store location	

* Data set up by user

\# Data can be set by user in range 0 to (L − 1) when function used to introduce a delay into a data stream

For complex application the user can manipulate both the read displacement and the write pointer.

Table 3 Fault conditions

Conditions	Result	Code in Zm	
		Numeric Value	States ON
Programming error No VALUE after SPEC	Q=0	-	-
Programming error Invalid VALUE location: (a) Number instead of address (b) Zm in write protected memory (c) Zm in table not usable by special functions	Q=0	-	-
Error in choice of Zm or store length too large: Zm+3+L beyond end of data tables memory area	Q=0	3	0 & 1
Store length invalid L<1	Q=0	5	0 & 2

Table 4 Conditions indicated by codes in Zm

Conditions	Code in Zm	
	Numeric Value	States ON
WRITE executed resulting in store becoming full (not full beforehand)	1024	10
WRITE executed into store which was already full, resulting in loss of oldest stored data item	3072	10,11
READ executed resulting in store becoming empty (not empty beforehand)	4096	12
READ executed form store which was already empty, resulting in output data which is repeat of previous output	12288	12,13

Note: Other numeric codes will be generated if user incorrectly manipulated the write pointer and/or the read displacement outside their permitted ranges. For details refer to Table 5 and inspect states 8 and 9 in Zm.

Table 5 Meaning of individual Zm flags

State ON in Zm	Condition indicated
0	Fault condition resulting in no data storage or retrieval
1	Error in choice of Zm or store length too large: Zm+3+L beyond end of data tables memory area
3	Store length invalid L<1
8	Invalid write pointer: WP was <0 or >(L − 1) and function was executed with default value WP=0
9	Invalid read displacement: RD was outside range and READ was executed with default value (a) RD was <0 default RD=1 (b) RD was >L default RD=L
10	Store full after WRITE executed
11	WRITE executed into store which was already full, resulting in loss of oldest stored data item
12	Store empty after READ executed
13	READ executed from store which was already empty, resulting in output data which is repeat of previous output

Note: For first in, first out store applications states 10 and 12 may be included in user program to warn when store full and empty. States 11 and 13 indicate that warnings have been ignored and invalid data may have resulted.

APPLICATION NOTES

1. METHODS OF APPLICATION

1.1 First in, First out store

Write pointer and read displacement initially zero (typically by using data table which is cleared on start up).

user presets store length.

User program controls WRITE and READ operation by varying mode control input from scan to scan, and employing flags in Zm to take appropriate action when store full or empty.

1.2 Delay in data stream

Write pointer initially zero (typically by using data table which is cleared on start up).

User presets store length.

User program sets mode control input to WRITE and READ on every scan.

User program sets read displacement to obtain desired delay (variable from scan to scan). State 9 in Zm indicates if out of range.

1.3 History recording and playback

Write pointer and read displacement initially zero (typically by using data table which is cleared on start-up).

User presets store length.

(a) Recording

Using program sets mode control input to WRITE at chosen time intervals. If the store full flags are ignored then the cyclic nature of the store will mean it always contains the L most recent samples of the chosen variable, up to the time that recording was stopped.

(b) Playback

If recording has stopped and user program sets mode control input to READ at chosen time intervals, recorded data will be replayed automatically. State 12 in Zm can be used to indicate replay complete.

If user sets read displacement to N, then N most recent samples can be replayed.

1.4 Complex applications

The write pointer and read displacement can be manipulated by the user program to obtain access to any data item. The store empty and full flags may not be meaningful under these circumstances.

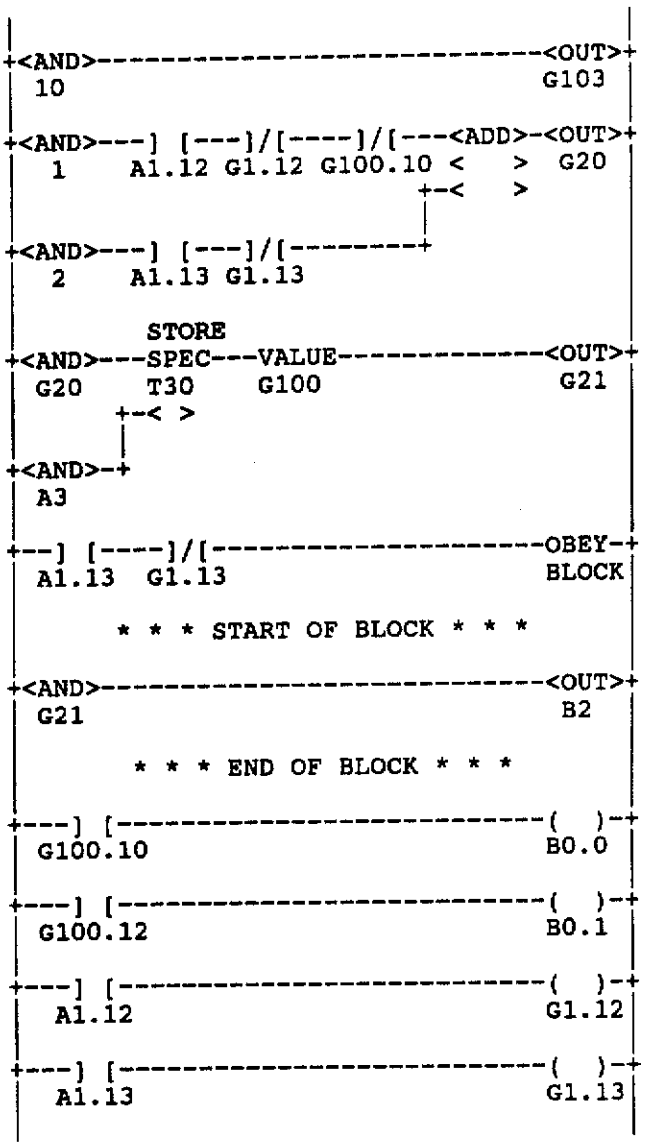
2. EXAMPLE OF FIRST IN FIRST OUT STORE

(a) Requirements

Store data (input A3) each time button (input A1.12) is pressed. Give warning (output B2) one item at a time as button (input A1.13) is pressed. Give warning (output B0.1) when store empty.

Storage required for 10 items

(b)



(c) Remarks

G1.12 and G1.13 used in conjunction with inputs
A1.12 and A1.13 to detect changes from OFF to ON

(d) Value data

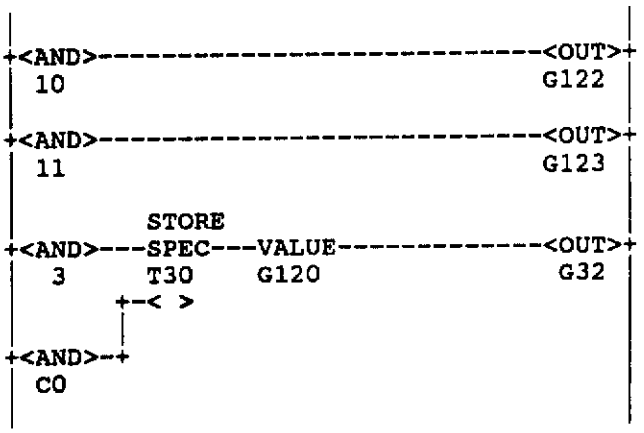
G100	flags (output by function)
G101	write pointer (output by function)
G102	read displacement (output by function)
G103	store length (set to 10 by program)
G104 to G113	storage locations (used by function)

3. EXAMPLE OF DELAY IN DATA STREAM

(a) Requirements

Sample analogue signal (input C0) on each scan of user program and set analogue signal (output D32) after delay of 10 scans (1 sec delay for typical 100ms program repetition interval).

(b) Program rungs



(c) Value data

G120	flags (output by function)
G121	write pointer (output by function)
G122	read displacement (set to 10 by user program)
G123	store length (set to 11 by user program)
G124 to G134	storage locations (used by function)

(d) Remarks

Store length has to be one greater than required delay because WRITE executed before READ.

Delay could be varied by changing contents of G122, flag G120.0 would indicate if out of range.

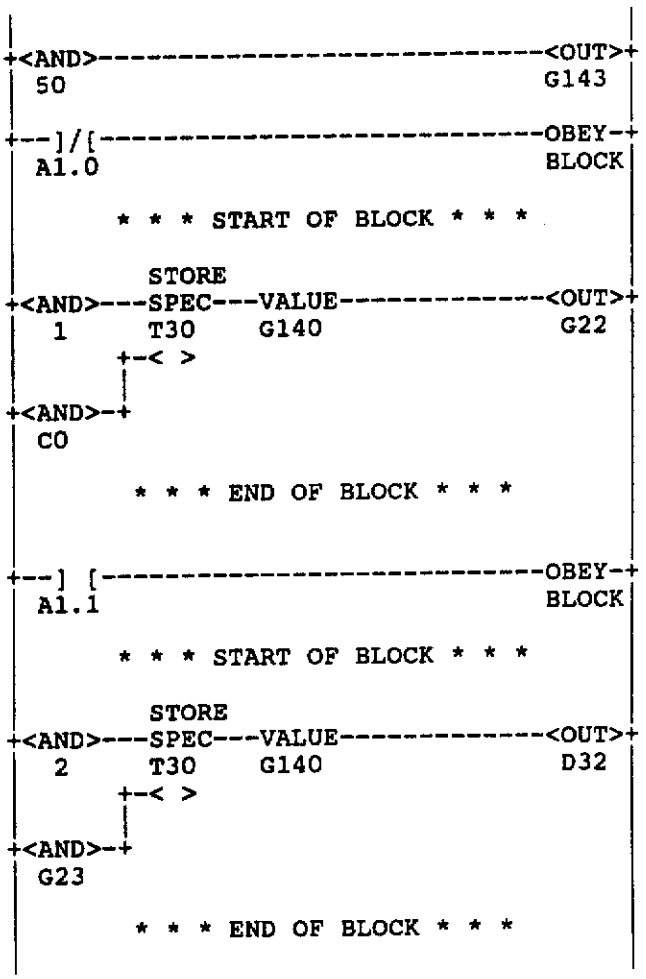
4. EXAMPLE OF HISTORY RECORDING

(a) Requirements

Record the 50 previous values of a variable (input C0) which immediately precede an event indicated by input A1.0 going ON.

Replay the stored values to output D32 when input A1.1 switched ON.

(b) Program rungs



(c) Value data

G140	flags (output) by function)
G141	write pointer (output by function)
G142	read displacement (output by function)
G143	store length (set to 50 by user program)
G144 to G193	storage locations (used by function)

(d) Remarks

If more than one delay was required, the user program could be altered so that it sets the real displacement to 50 whenever A1.1 goes from OFF to ON.

CEGELEC
INDUSTRIAL CONTROLS

Kidsgrove, Stoke-on-Trent, ST7 1TW, England
Tel: (0782) 783511 Fax: (0782) 776329

Publication No. T317 Issue 4