ZEN
Quick Guide

THIS MANUAL CONTAINS:

1 FEATURES
2 FUNCTIONALITY
3 HANDLING THE EQUIPMENT
4 CONNECTIONS
5 I/O ADDRESSING
6 CREATING A PROGRAM
7 PROGRAMMING FUNCTIONS
8 TROUBLESHOOTING
9 ACCESSORIES

1 Features

The ZEN programmable logic module provides a total of 10 I/O points (6 inputs and 4 outputs). It has two types of controllers:

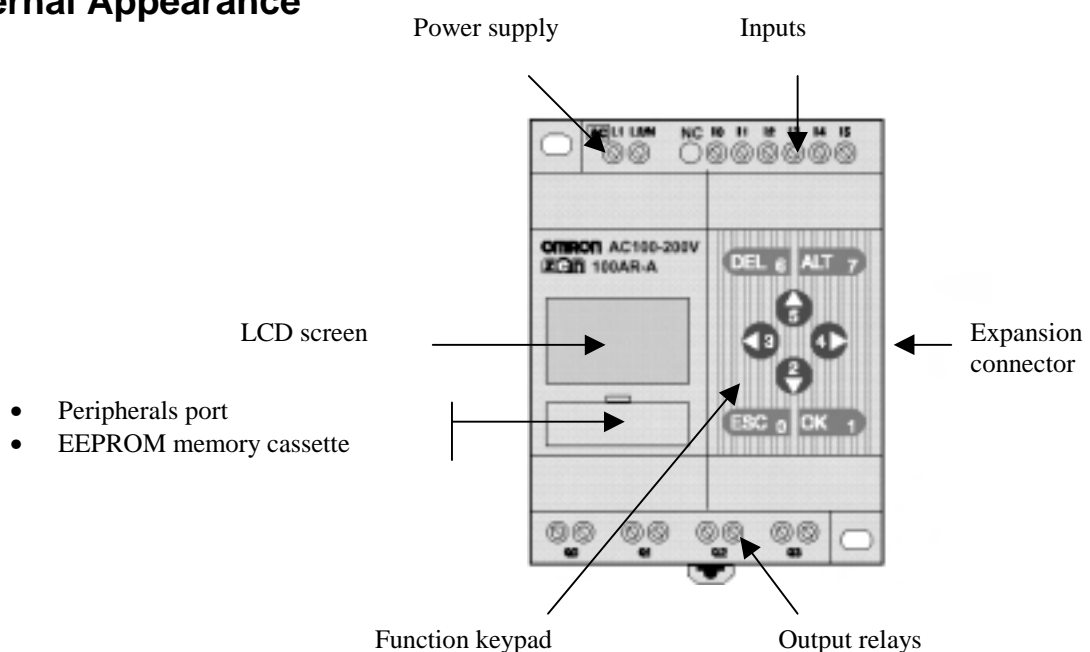LCD type: with display screen and keypad.
LED type: without display screen and without operating keypad.
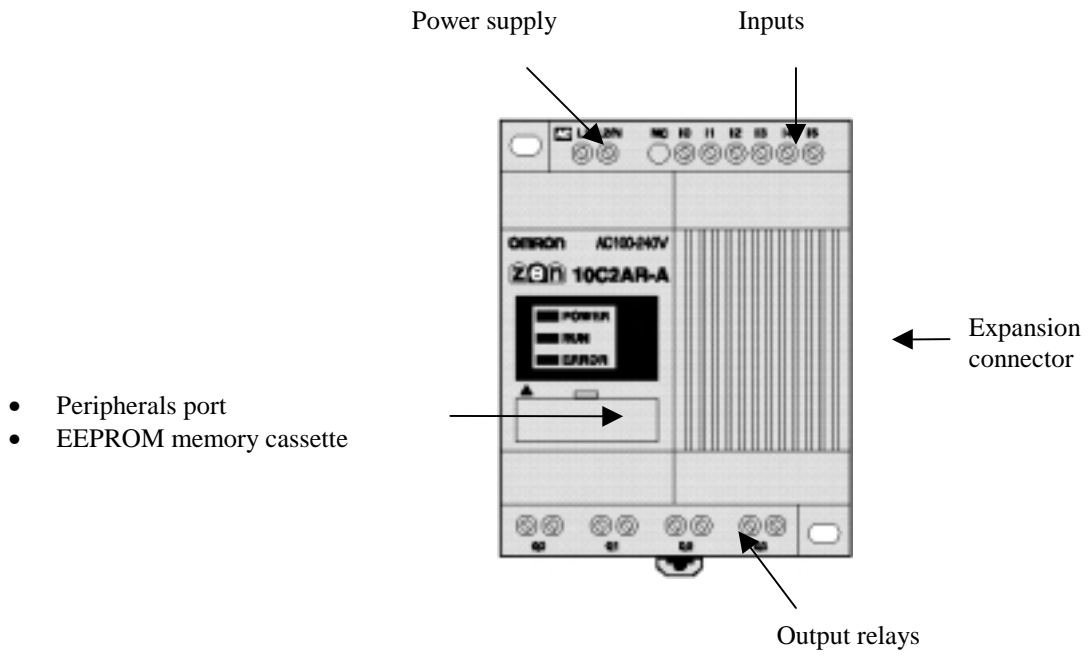
1.1 Main Features

The following are some of the most important features:

- Capacity to carry out small scale automatic control at low cost.
- Ladder diagram programming directly in the LCD type CPUs is possible.
- Maximum program capacity of 96 lines.
- Very small dimensions: 90 x 70 x 56 mm.
- Easy to set up and reduced wiring time.
- Upgradable up to 18 inputs and 16 outputs using 3 expansion modules.
- Protection against power supply faults (battery optional).
- Programs easily copied using optional memory cassette.
- Programming and monitoring by computer.
- Large switch capacity up to 8A /contact with 250 VAC.
- Direct AC inputs between 110 and 240 VAC.
- Equipped with 8 configurable timers in 4 operating modes and 3 timer ranges.
- Also equipped with 8 counters which can work either inclined or declined.
- Clock-calendar functions.
- 2 analog inputs in voltage mode (0 to 10 V).
- Possibility of configuring input filters to avoid noise influence.
- The program can be protected by a password.
- Screen menus displayed in 6 languages.

1.2 External Appearance

Power supply   Inputs

LCD screen   Expansion connector

- Peripherals port
- EEPROM memory cassette

Function keypad   Output relays

Power supply   Inputs

- Peripherals port
- EEPROM memory cassette

Expansion
connector

Output relays

2. Functionality

The display screen for the LCD type CPU and the different ZEN operation buttons are as follows:
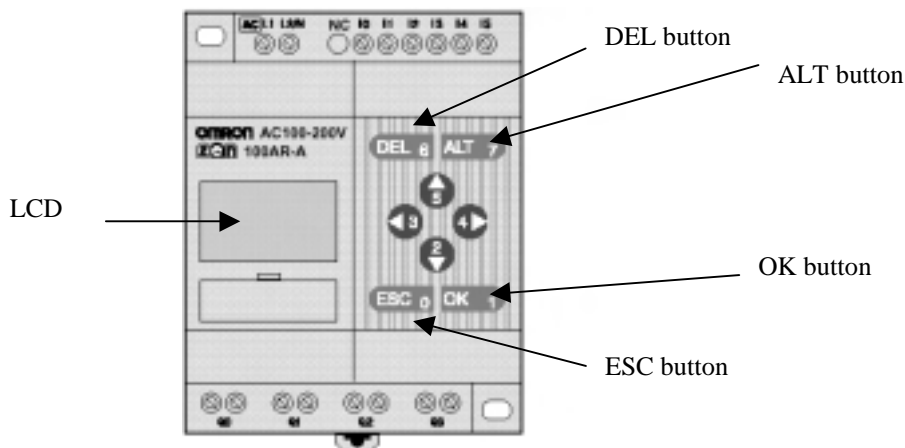
A series of icons giving information about the controller can be activated in the display. The meaning of these icons is given in the following table:

| Icon	Meaning
RUN	Displayed on screen when in RUN mode
ERR	Shows an error
▲	Displayed on screen when there is a higher level on the menu or in the ladder program
▼	Displayed on screen when there is a lower level on the menu or in the ladder program
O━	Displayed on screen when the password has been activated

Function keypad

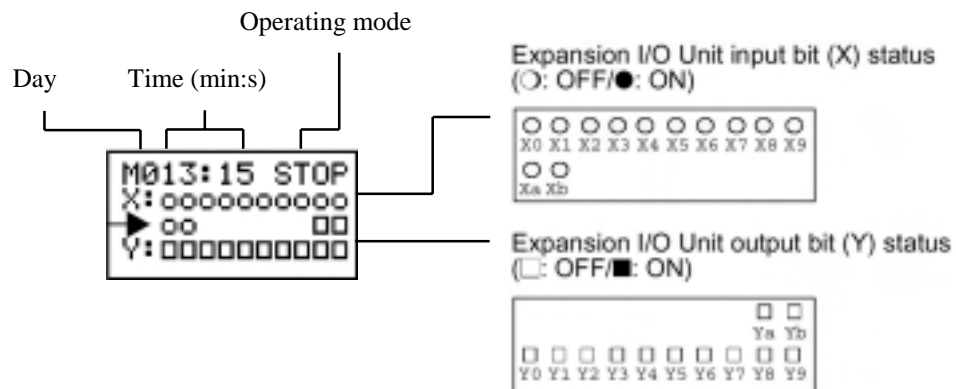| Key	Function			
	Menu	Overwriting the program	Parameter Settings	Associated bit
DEL	---	Deletes inputs, outputs, connection lines and blank lines	---	B6 to ON
ALT	---	Switchs to normally open and normally closed conditions.	---	B7 to ON
Up	Moves the cursor up and down	Moves the cursor up and down. Selects bit types and functions.	Moves the cursor up and down. Changes numerals and parameters	B5 to ON
Down				B2 to ON
Left	---	Moves the cursor to the right and left	Moves the cursor to the right and left	B3 to ON
Right				B4 to ON
ESC	Returns to previous screen	Cancels operations carried out and returns to the previous operation	Cancels operations carried out and returns to the previous operation	B0 to ON
OK	Enters the menu selected	Confirms the settings	Confirms the settings	B1 to ON

3. Handling the Equipment

This section describes the handling of the display menu and its different options, such as protecting ladder programs, installing filters on inputs, adjusting the display contrast, setting the clock to summer time, etc.
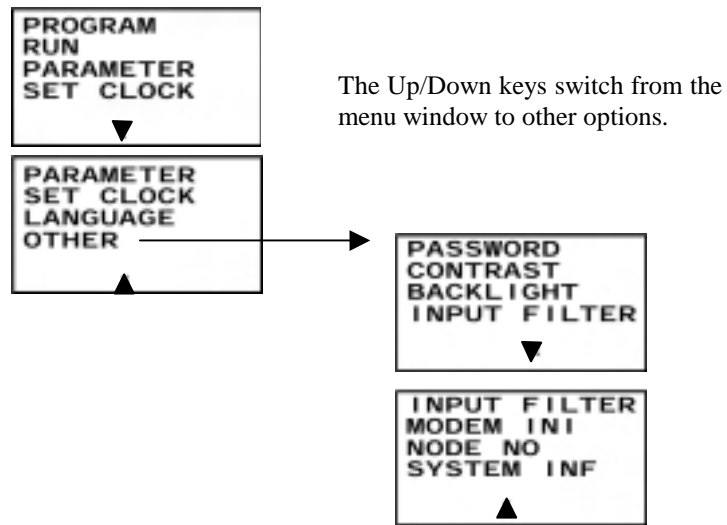
3.1. Main Menu

The following screen is displayed as ZEN receives the power supply:
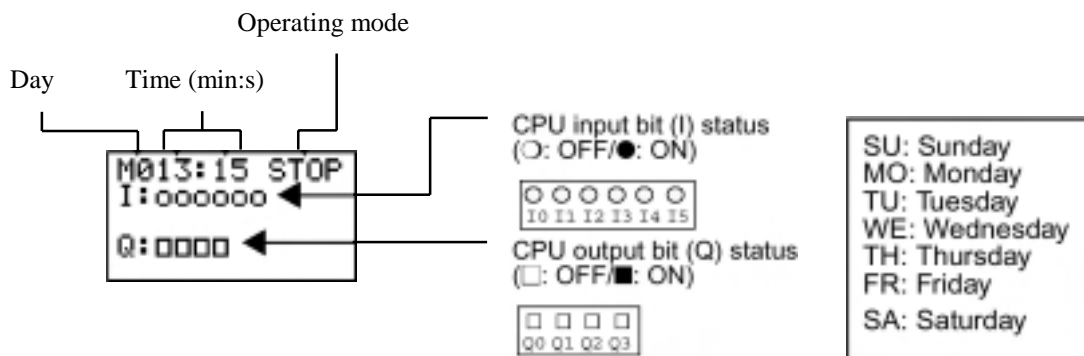
In the case of any expansion module being connected, pressing the ESC key will monitor the status of the expansion bits.
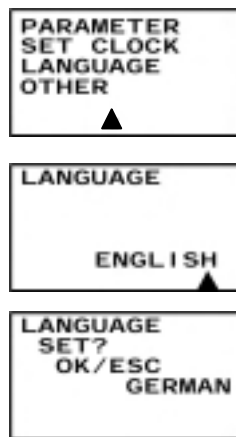
The main menu is displayed by pressing the OK key on the initial screen, as shown below:

```
PROGRAM
RUN
PARAMETER
SET CLOCK
    ▼
```

The Up/Down keys switch from the menu window to other options.

```
PARAMETER
SET CLOCK
LANGUAGE
OTHER
    ▲
```

```
PASSWORD
CONTRAST
BACKLIGHT
INPUT FILTER
    ▼
```

```
INPUT FILTER
MODEM INI
NODE NO
SYSTEM INF
    ▲
```

3.2. Selecting the Language

The ZEN menu is available in 6 languages, which can be selected as follows (the default language is English)

```
PARAMETER
SET CLOCK
LANGUAGE
OTHER
    ▲
```

Select LANGUAGE and press OK. By doing this, the language selection screen is displayed and by pressing the OK key again, the language flashes, making it possible to select another language using the cursors.

```
LANGUAGE


ENGLISH
    ▲
```

```
LANGUAGE
 SET?
  OK/ESC
      GERMAN
```

Once the language has been selected, press OK and this confirmation window will appear.

3.3. Date and Time

Access to the date and time settings window can be gained by following the menu sequence shown below:

```
PARAMETER
SET CLOCK
LANGUAGE
OTHER
    ▲
```

```
SET CLOCK
SUMMER TIME
```

```
SET CLOCK
yy/mm/dd
00/01/01
  00:03(SA)
```

3.4. Protecting Programs

ZEN has a password function, used to prevent incorrect use of the ladder program or to prevent manipulation of settings made by the controller.

The password code may comprise the range 0000 to 9999 (4 decimal numbers).

The password prevents entry to the following points:

- Editing ladder programs
- Monitorng ladder programs
- Changing or erasing the password
- Setting the input filter
- Setting the node number

The Password screen is displayed immediately any of the different options is selected from the menu. If the password is correct, access to the screen requested will be given. If not, access will be denied.

3.5. Setting a Password

Select OTHER on the main menu and then the PASSWORD option.

Press the OK key so that the cursor flashes and the password can then be entered

Set the Password.
Use the Left and Right keys to select the digits that need to be changed.
Use the Up/Down keys to enter numbers from 0 to 9.

Press the OK key. A confirmation message will be displayed on the screen

The key symbol will be displayed in the bottom left-hand corner of the screen when the password has been recorded.

3.6. Deleting Registered Passwords

Select *Other/Password.*

PASSWORD

0000

Press the OK key so that the cursor flashes and then enter the password.

Enter the recorded password.

PASSWORD

1234

Use the Left and Right keys to change the numbers of the new password
Use the Up/Down keys to enter numbers between 0 to 9.

PASSWORD
CANCEL?
OK/ESC

1234

Press the OK key to display the message on screen confirming deletion of the password.
If the input password does not match to the original, the display will return to the previous screen.
If the password is correct, press the OK key to delete.

PASSWORD
CONTRAST
BACKLIGHT
INPUT FILTER

They key icon will disappear when the password has been deleted.

PASSWORD
CANCEL?
CHECK ERR

1234

If the input password does not match to the recorded password, a 'CHECK ERR' message will appear on screen. The password must be reentered.
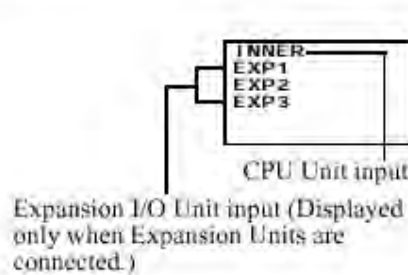
3.7. Stabilizing Input Operations

If the ZEN external input fluctuates, it is possible that the operations will be unstable. To solve this, ZEN is able to filter inputs to stablilize the signal.

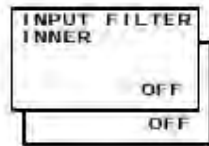The input filters can be set separately, either for the CPU inputs or for each I/O expansion unit.

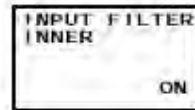Press the OK key to display the input filter setting menu.

Use the Up/Down keys to select from the Menu the unit for which the input filters will be set.

Press the OK key twice to make the cursor flash, activating the input filter.

Use the Up/Down keys to switch between ON/FF.

Press ON to confirm the settings. Press ON again to complete the settings.

Note. The input filter time settings are as follows:

Input specifications		Input filter not used	Input filter used
AC Input	100 Vac	50 ms	70 ms
	240 Vac	100 ms	120 ms
DC Input		15 ms	50 ms

The input filter settings are read when ZEN starts the operation.

3.8. Backlight

The LCD backlight is automatically activated when the operation keys are used. Depending on the setting (see below for more details), this light will switch itself off 2, 10 or 30 minutes after the function keys have stopped being used. The backlight can also be left activated (setting always in ON mode).
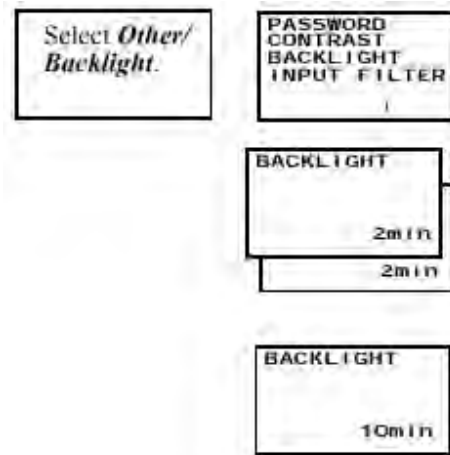
Press the OK key to display the current backlight time.

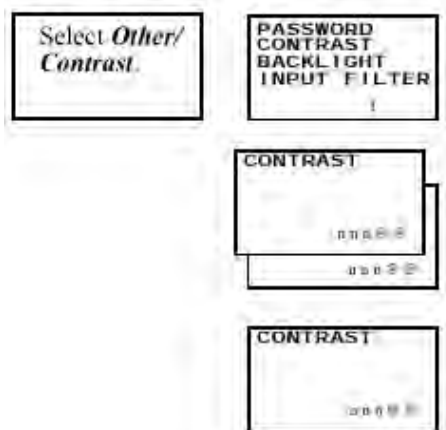Press the OK key again to a flashing cursor to change this time.

Use the Up/Down keys to select activation time.
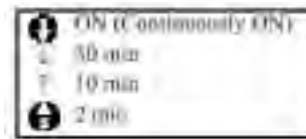
Press the OK key to confirm the settings. Press again to complete the settings.

3.9. Adjusting LCD Screen Contrast

Use the following procedure to adjust the LCD contrast when it is difficult to view the screens.

Press the OK key to view the current contrast setting. This will be displayed in the form of a bar graph (5 levels).
A blank level shows that this setting has not been reached.

Press the OK key again to a flashing cursor to vary the contrast. The contrast setting can be changed using the Up/Down or Right/Left keys.

Pressing the OK key once again requests confirmation of the new setting. If pressed, it will be confirmed. Pressing the ESC key will exit the Contrast Menu with no changes being made.

3.10. Setting Summertime

In some countries like our own, the time is changed when a certain season of the year comes around. ZEN contains this option, which is known as summertime.

The following steps must be taken to carry out these changes:

Press the OK key to enter the Summertime Menu.
If pressed again, the cursor flashes, allowing the setting to be changed.

Select one of the options in the table using the Up/Down keys.

If OK is pressed, the selection is confirmed and if the key is pressed again, confirmation is given.

Cancel	Summertime settings not made.	
Manual	The clock is put forward one hour	
EU Type	Period : From 2:00 am the last Sunday in March until 2:00 am the last Sunday in August	Once the start time (2:00 am) has been reached, the clock is put forward one hour 3:00 am). When the stop time (2:00 am),the clock is put back one hour (1:00 am).
US Type	Period : From 2:00 am the first Sunday in April until 2:00 am the last Sunday in August	

Note. On entering the clock display screen, Summertime is activated and an "S" is displayed in the top right-hand corner to show that this function has been set.
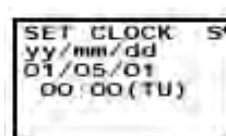
3.11. Reading System Information

Accessing this option will inform you about the CPU Software version, the CPU unit number and I/O points in the expansion units.

U01.00	Software version (e.g.: 1.00)
010401	Date software created
INT: I06O04	No. of CPU I/O points
EX1:I04O04	No. of I/O points in the exp. unit 1
EX2:I04O04	No. of I/O points in the exp. unit 2
EX3:I00O04	No. of I/O points in the exp. unit 3
RMT:I00000	(for function expansion)
LCD:YES	LCD screen selection
RTC:YES	Clock-calendar selection
ADC:NO	Analog input selection

4 Connections

4.1 Input Stage

- Using AC power supply

Input devices

ON ƒ 80V
OFF   25V

CPU

I/O expansion unit
(AC inputs)

- Using DC power supply

Input devices

ON ƒ 16V
OFF   5V

CPU

I/O expansion unit
(DC inputs)

Note. Inputs 14 and 15 can also be used as analog inputs with an input range of 0 to 10 V.

4.2 Output Stage

CPU

I/O expansion unit

250 VAC, 8A
24 VDC, 5A

Note. The 4 outputs are completely independent and have no restrictions on polarity.

5. I/O Addressing

The following tables show the I/O addressing, work areas, internal holding bits, Timers, Counters and ZEN intelligent control screen bits.

I/O, Work and Internal Holding Bits

Area name	Symbol	Bit addresses	N° bits	Function	Ladder Program
Input bits	I	I0 to I5	6	Displays the ON/OFF status of the input device connected to the CPU input terminal	N.O. / N.C inputs (see note 1)
Expansion input bits	X	X0 to Xb	12	Displays the ON/OFF status of the input device connected to the I/O expansion unit input terminal	
Button switch	B	B0 to B7	8	Displays the ON/OFF status of the CPU operating switches (LCD-type CPU)	
Analog comparator	A	A0 to A3	4	Outputs the comparison result for analog inputs. Only available for models with a 24 Vcc power supply.	
Comparator bits	P	P0 to Pf	16	Compares the present value of timers (T), holding timers (#) and counters (C) and outputs the comparison result.	
Output bits	Q	Q0 to Q3	4	Displays the ON/OFF status of the output deivces connected to the CPU unit	N.O. / N.C outputs (see note 1.2)
Expansion output bits	Y	Y0 to Yf	16	Displays the ON/OFF status of the output deivces connected to the I/O expansion unit	
Work relays	M	M0 to Mf	16	Can only be used with the ladder program. Cannot output to an external device.	
Holding relays	H	H0 to Hf	16	The same as previous area but also maintains its status even without power supply on.	

Note
1   N.O. : Normally open N.C. : Normally closed
2   The following functions can be selected for output bits

[	Normal output	Turns to ON or OFF according to the ON/OFF status of execution condition
S	Set	When the condition is ON, the output turns to ON
R	Reset	When the condition is OFF, the output turns to OFF
A	Alternative	Alternates the output ON/OFFwhen the execution condition is in ON

Timers and Counters

Area name	Symbol	Bit addresses	N° bits	Function	Ladder Program
Timer	T	T0 to T7	8	Can be activated between ON-delay, OFF-delay, one-shot and flashing pulse operation.	N.O. / N. C condition (see note 1)
Holding timer	#	#0 to #3	4	Maintains the timer value when the trigger input is in OFF mode. The timer will continue even if turned to ON mode again.	
Clock timer	@	@0 to @7	8	Can be put into ON or OFF mode on a specified day or period.	
Calendar timer	*	*0 to *7	8	Can be put into ON or OFF mode on a specified date.	
Counter	C	C0 to C7	8	Reversible counter	

Note Timers can have the following functions.

| X	ON delay	Time elapsed from the moment the input is triggered until the set timer bit turns to ON mode.
n	OFF delay	The timer bit turns to ON mode from the moment the input is triggered until the set time has elapsed on the timer.
O	One-shot	The set timer bit turns the selected time to ON mode when the trigger input switches from OFF to ON mode.
F	Flashing pulse	The set timer bit constantly switches from OFF to ON mode while the trigger input remains in ON mode

Display Bits

Area name	Symbol	Bit addresses	N° bits	Function	Ladder Program
Display	D	D0 to D7	8	Displays predefined messages relating to timers, counters and their present values or converted analog values.	Output

I/O Bit Addressing

The bit input addresses 10 to 15 and the bit output addresses Q0 to Q3 are always allocated to the CPU unit.

Up to 3 I/O expansion units can be added, allocating these I/O points to the X0 to Xb input bits and Y0 to Yb as output bits, remembering the order of the connected expansion units.
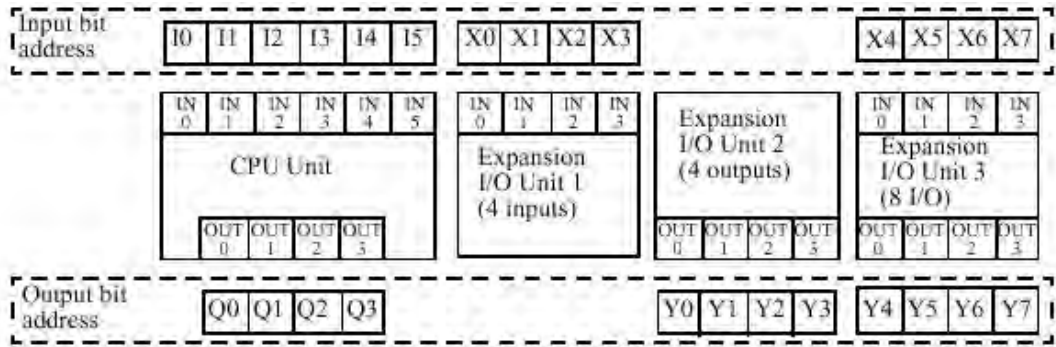
Note

When the I/O expansion unit does not have I/O points, such as a 4-point input or output unit as shown above, the unused bit addresses are not allocated in the unit and can be used for the following expansion unit.
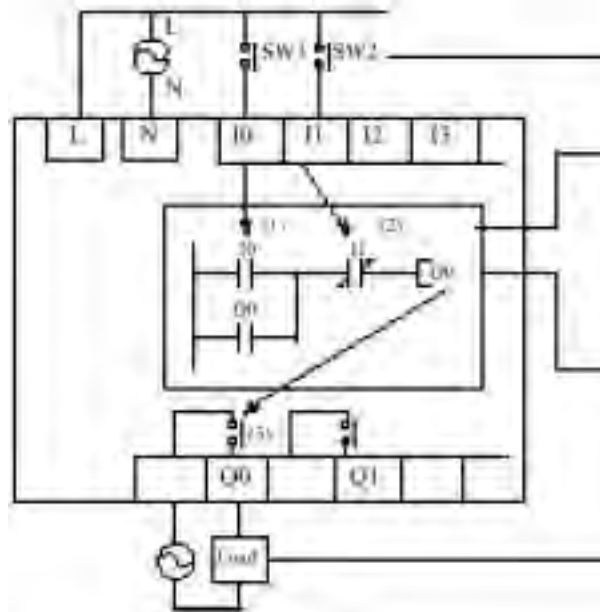
6. Creating the Program

This section gives a step-by-step explanation of how to implement a simple contact diagram or circuit on ZEN, and the programming from the display. The circuit to be used is the following:
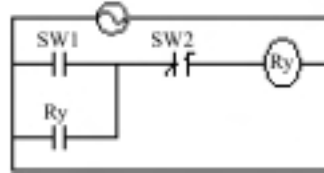
6.1. I/O Wiring

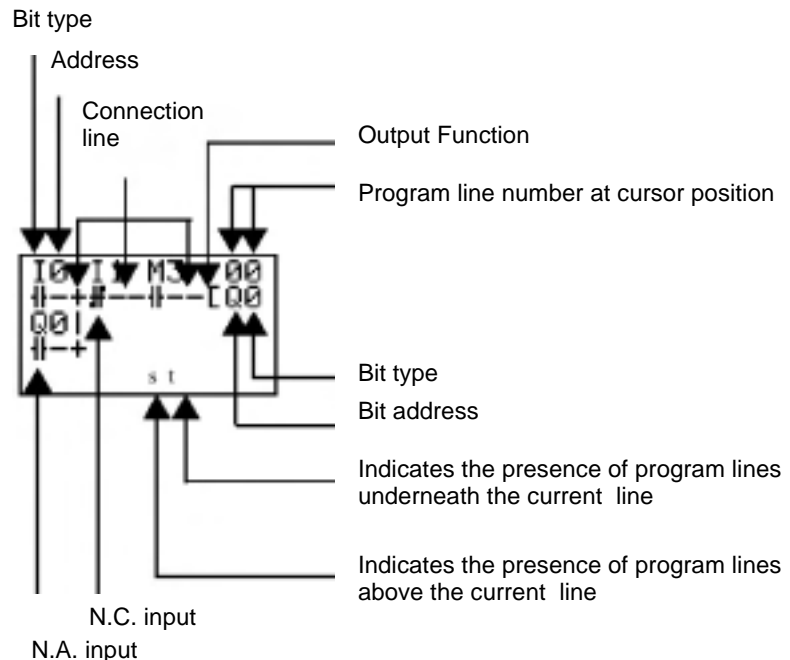## 6.2. Clearing the Programs

OK (1)

- STOP Mode

Clear the program before you start writing the program. By using this option, neither the language display, the date/time nor the other settings will be initialized.

OK (1) + ⇓ (2)

OK (1)

OK (1)

6.3. Writing the Program

- STOP Mode

M013:15 STOP
I:000000

Q:□□□□   **OK (1)**

PROGRAM
RUN
PARAMETER   **OK (1)**
SET CLOCK

EDIT PROG
DELETE PROG
                OK (1)

Shows the ladder program line number at the cursor position.

00
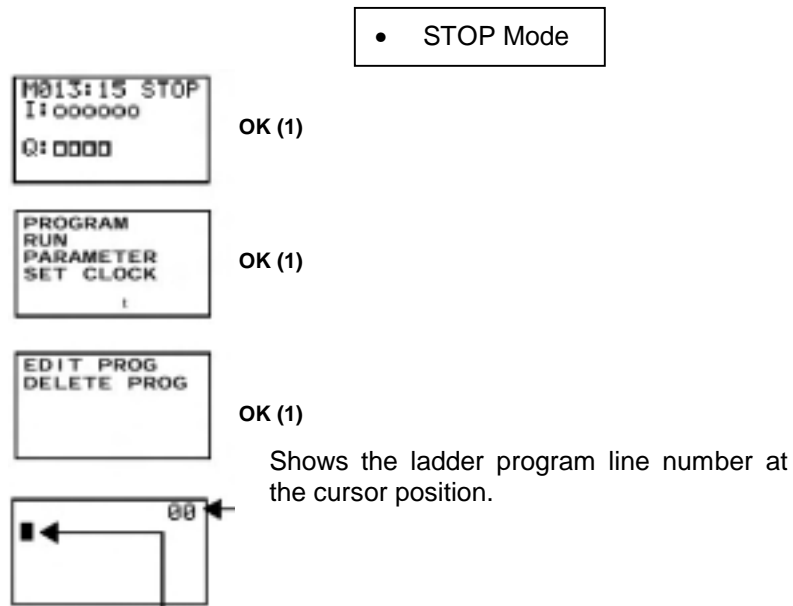
Two circuit lines, up to a total of 96 program lines, can be displayed on the screen at the same time and a maximum of 3 contacts and one output per program line can be entered.

An example of a ladder diagram:

Bit type

Address

Connection line

Output Function

Program line number at cursor position

I0 I M3 00
Q01

Bit type

Bit address

Indicates the presence of program lines underneath the current line

Indicates the presence of program lines above the current line

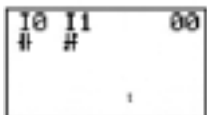N.C. input

N.A. input

6.3.1. Writing Input Contacts

Once in the program editing screen, press "**OK** (1)" and the 0 (10) input contact appears on the left-hand side of the first line of the program.

```
I0 I0        00
 ╫   ╫
             
             ı
```
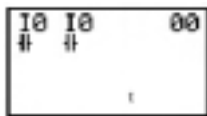
Press "**OK** (1)" again to enter another N.A. contact in series with the previous contact.

```
I0 I0        00
 ╫   #
             
             ı
```
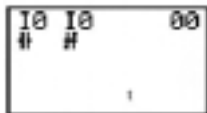
Press "**ALT** (7)" to select the N.C. input.

```
I0 I1        00
 ╫   #
             
             ı
```

Use the "♣(4)" key to move the cursor and press " ⇑ (5)" to change the bit address to 1.

```
I0 I1        00
 ╫──#    ■
             
             ı
```

Press "**OK** (1)" to enter another new N.A. contact in series with the previous contacts. This creates the automatic connection between the first two contacts entered.

6.3.2. Writing Outputs

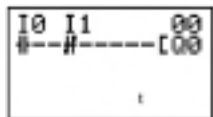First, before entering the output relay, the union line has to be inserted as follows:

```
I0 I1        00
 ╫──#   ←
             
             ı
```
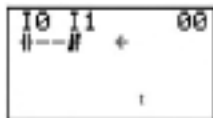
Press "**ALT** (7)" to enable entering the connection line option.

```
I0 I1         00
 ╫──#───  ←
             
             ı
```
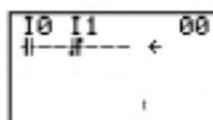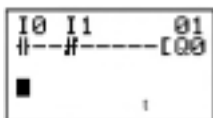
The connection line is definitively set up with the "♣(4)" key.

Once the line has been inserted, the cursor is situated on the right of the program line and the output relay is entered:
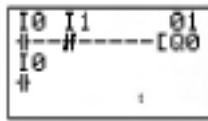
```
I0 I1        00
 ╫──#─────[Q0
             
             ı
```

Press "**OK** (1)" to enter an initial Q0 output. The output type can be selected using the "⇑ (5)" and "⇓ (2)" keys.

```
I0 I1        01
 ╫──#─────[Q0
 ■
             ı
```
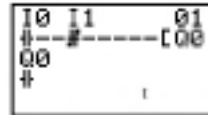
Press "**OK** (1)" twice to confirm writing Q0 output. The cursor will automatically go to the next line of the program.
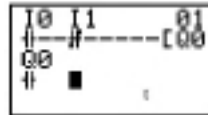
6.3.3. Writing a Parallel Line (OR)
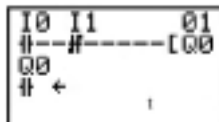
Press "**OK** (1)".
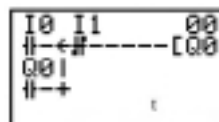
Select Q (CPU output bit) using the "⇑ (5)" key.

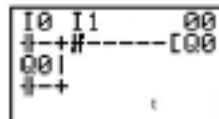Confirm writing the contact by pressing "**OK** (1)" twice.

6.3.4. Vertical Connection Lines

Press "**ALT** (7)" to enable entering the vertical connection line option.

The vertical and horizontal connection lines are inserted using the "⇑ (5)" key. The (+) symbol indicates the intersection.

Pressing "**OK** (1)" confirms writing the connection lines.

7. Programming Functions

7.1. Timers (T) and Holding timers (#)

ZEN has the capacity to use 8 normal timers and 4 holding timers.

Timers	The present value of the current timer is reset when ZEN switches from Run mode to Stop mode or when the power supply is turned off.
Holding Timers	The present value of the timer will be maintained even when ZEN switches from Run mode to Stop mode or when the power supply is turned off. The time will continue running when the input 'trigger' is in ON mode again. The ON status of the timer bit will also be maintained. It is only supported by the holding timers at connection.

Timer Operation (T0 to T7)

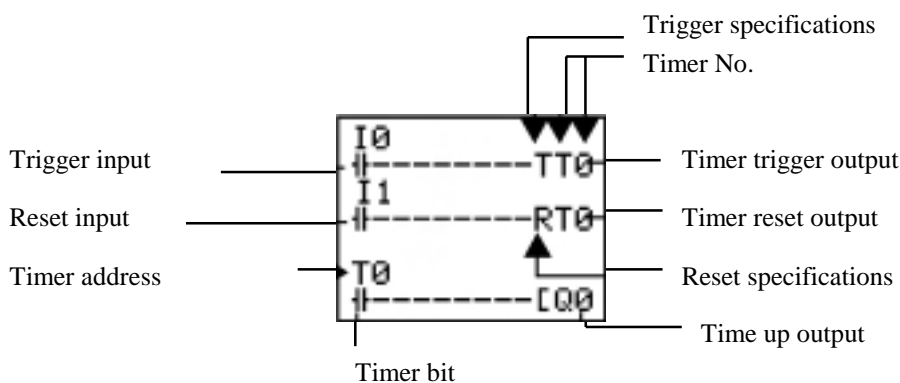|	Timer Type	Operation		Applications
X	Timer at connection	Output is activated when the set time elapses on the input being triggered.		Delay operations in On-status
n	Timer at disconnection	Output is activated from when input switches to ON mode until the set time elapses.		Useful for timers, lighting or ventilation fans
O	Flashing pulse timer	The set timer bit switches the selected time to ON mode when input changes from OFF mode to ON mode.		Useful for repetitive operations when the operation to be carried out requires the same time period
F	Flashing pulse timer	The set timer bit switches repeatedly from ON mode to OFF mode, while input is in ON mode		Useful as an alarm circuit, for visible or audible emergency alarms.

Note. The 'n' code means 'null' (blank code on the console)

Holding Timer Operation (#0 to #3)

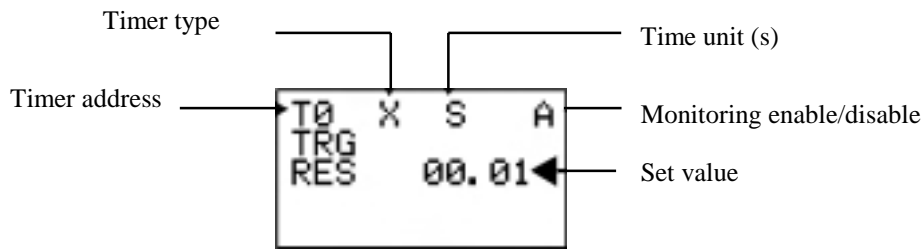| Timer Type		Operation			Applications
X	Delay timer at connection	Output is activated when the set time elapses as input is triggered.			In systems where timing must continue even in cases where power suply is null.

7.1.1. Settings in the Ladder Program

Input triggers, output resets and input timers are drawn on the 'Edit Screen'. The timer setting is carried out on the Parameter Settings Screen.

Timer address	Timer: T0 to T7 Holding Timer : #0 to #3	
Trigger input	T (TRG)	Controls the timer trigger output. Triggers the time when the trigger input switches to ON mode.
Reset input	R (RES)	Controls the timer reset output. When the reset input switches to ON mode, the present value is reset and the timer bit switches to OFF mode. The trigger inputs are not active while the reset input is in ON mode.
Timer bit	Turns ON mode according to the setting	

7.1.2. Settings in the Parameters Settings Screen

Timer type

Time unit (s)

Timer address

```
T0    X    S    A
TRG
RES        00.01◄
```

Monitoring enable/disable

Set value

Timer types

X	ON delay
n	OFF delay
O	One-shot pulse
F	Flashing pulse

Time units and settings

S	00.01 to 99.99 s (in 0.01 s units)	Error: 0 to 10 ms
M:S	00 min 01 s to 99 min 59 s	Error: 0 to 1 s
H:M	00 h 01 m to 99 h 59 m (in hours and minutes)	Error: 0 to 1min

Monitoring enabled/disabled

A	Parameters can be monitored and settings changed
D	Parameters cannot be monitored nor can settings be changed

7.1.3. Parameter Monitoring on 'Screen Display'

Trigger input status
(m:OFF / l:ON)

Timer present value

```
T0   ▼X  ▼S    A
TRGo     00.00o
RESo     15.00

RUN
```

Bit timer status
(m:OFF / l:ON)
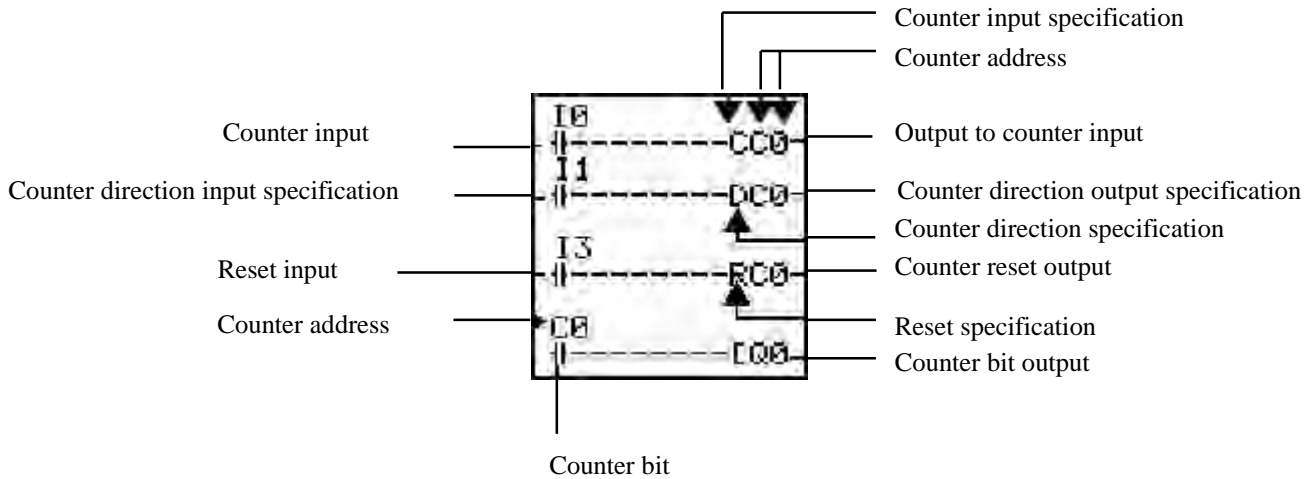
Reset input status
(m:OFF / l:ON)

Timer parameters
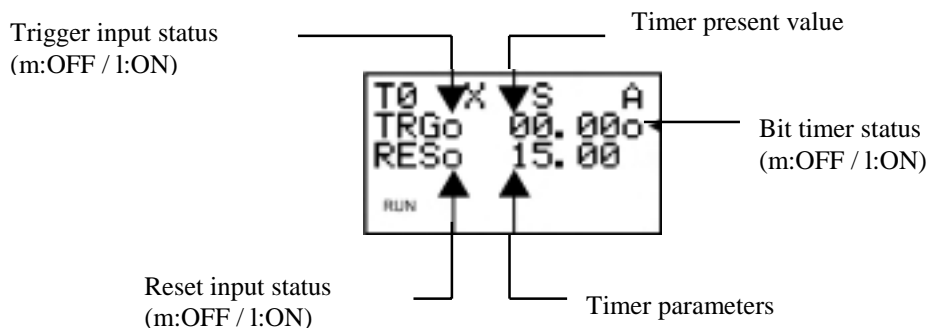
7.2. Using Counters (C)

Up to 8 counters can be used in incremental or decremental mode. The present or current value (PV) of each counter and the status of the bits of each counter (ON/OFF) are maintained even when the operation mode changes or when there is no power supply.

The counter bit switches to ON mode when the count value (PV) exceeds the set value (present value • set value). The counter is reset and its corresponding bit turns to OFF mode when the reset input is activated (ON mode). The count input is not effective while the reset input is active.

7.2.1. Settings in the Ladder Program

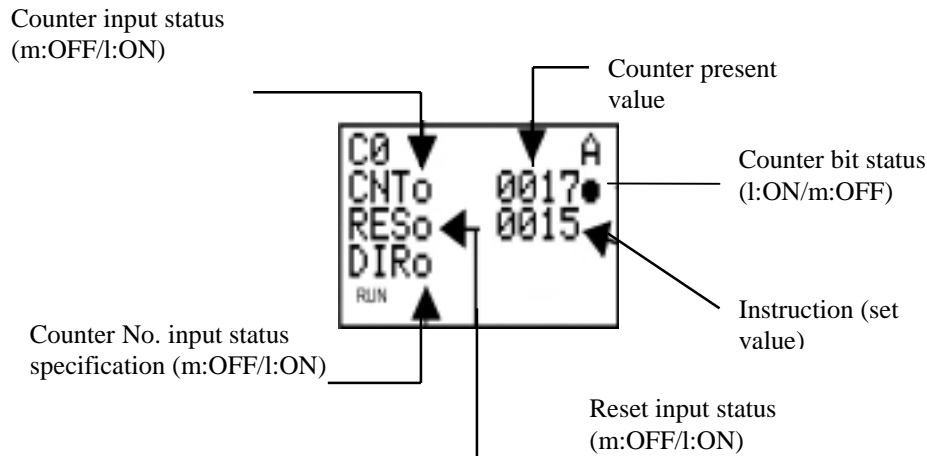| Counter No.	C0 to C7 (8 points)	
Counter input	C (CNT)	Increases (or decreases) each time the counter input is activated.
Counter No. input specifications	D (DIR)	Count mode selection OFF: Incremental ON: Decremental
Reset input	R (RES)	When the reset input is in ON mode, the present value resets and the corresponding bit switches to OFF mode. The counter input will not be effective while the reset input is in ON mode.
Counter input	Activated when the present value ≥ the set value	

7.2.2. Settings in the Parameter Settings Screen
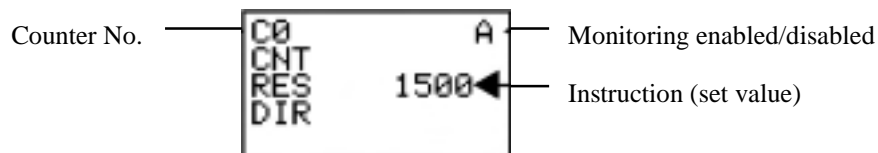
Instruction (set value)	0001 to 9999 (4 decimal digits) times	
Monitoring enabled/disabled	A	The parameters can be modified and monitored
	D	The parameters cannot be modified or monitored

7.2.3. Parameter Monitoring on the Screen Display

Counter input status
(m:OFF/l:ON)

Counter present
value

Counter bit status
(l:ON/m:OFF)

```
C0          A
CNTo    0017●
RESo    0015
DIRo
 RUN
```

Instruction (set
value)

Counter No. input status
specification (m:OFF/l:ON)

Reset input status
(m:OFF/l:ON)

Note.

1. To reset the present value and the counter bit status (ON/OFF mode) due
    to a power supply fault or a change in operating mode, a reset circuit must
    be created which should be activated first. This circuit may be something
    like the following:

```
M0
┤├--------RC0
--------[M0
```

Counter reset output

2. If the counter input and the counter direction are input simultaneously,
    place the counter direction output in the program before the counter input.

```
I1
┤├--------DC0
I0
┤├--------CC0
```

Counter direction output
specification

Output to counter input
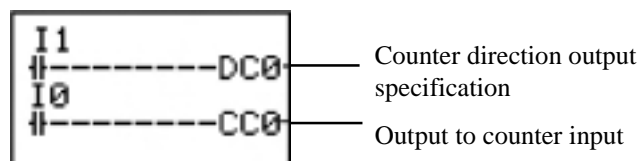
7.3. Using Weekly Timers

Weekly timers switch to ON mode between the start time and the end of the
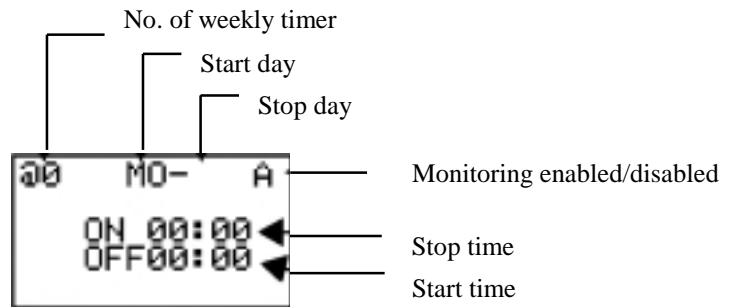specified day. Weekly timers have 8 points (@0 to @7).

7.3.1. Settings in the Ladder Program

Weekly timer inputs are written in the ladder program edit screen. Settings are carried out in the parameter settings screen.

Weekly timer address

Output to activate
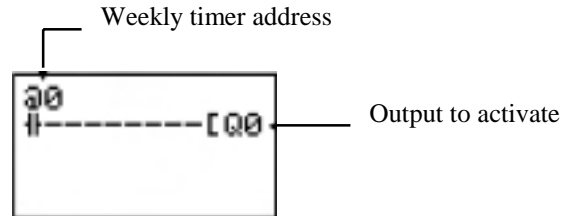
No. of weekly timers	@0 to @7

7.3.2. Settings in the Parameter Settings Screen

No. of weekly timer

Start day

Stop day

Monitoring enabled/disabled

Stop time

Start time

Note. When the flashing cursor is on the start day, press the left key followed by the Up/Down keys to set the stop day. If the start day is not correctly set, the timer will operate only according to the time set.

| Day	Start day	Sun/Mon/Tues/Wed/Thurs/Fri/Sat
	Stop day	Sun/Mon/Tues/Wed/Thurs/Fri/Sat/None
Time	Start time	00:00 to 23:59
	Stop time	00:00 to 23:59
Monitoring enabled/disabled	A	The parameters can be modified and monitored
	D	The parameters cannot be modified or monitored

Setup and operation		Example	Operation
Start and stop days	When the start day is before the stop day	MO - FR	Operates Monday to Friday every week
	When the start day is after the stop day	FR - MO	Operates every Friday through to the following Monday
	When the start day is the same as the stop day	SU - SU	Operates regardless of the day of the week
	When the stop day is not set	SU -	Operates only every Sunday
Start and stop times	When the start time is before the stop time	ON: 08:00 OFF: 17:00	Operates from 8:00 to 17:00 every day
	When the start time is after the stop time	ON: 21:00 OFF: 06:00	Operates from 21:00 to 6:00 the following day
	When the start time is the same as the stop time	ON: 13:00 OFF: 13:00	Operates regardless of the time

## 7.3.3. Parameter Monitoring in the 'Screen Display'
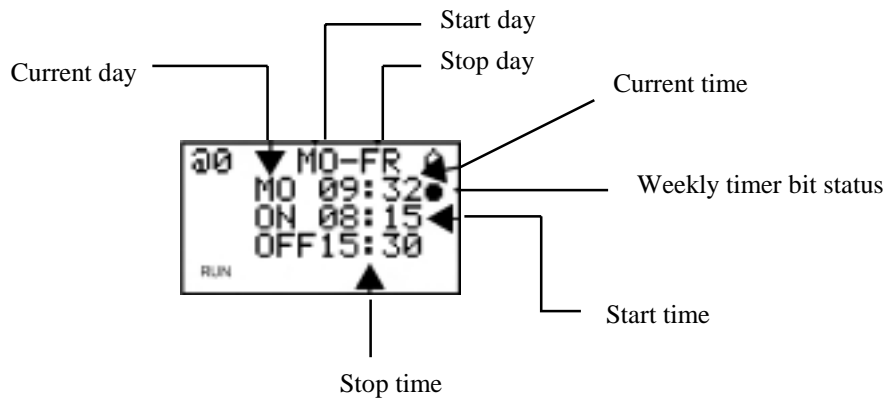
7.4. Using Calendar Timers (*)

Calendar timers are activated on specific dates. ZEN has 8 calendar timers (*0 to *7).

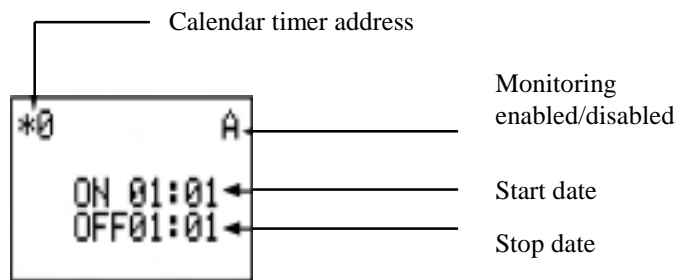The calendar timer bit is ON between 1 April and 31 August.
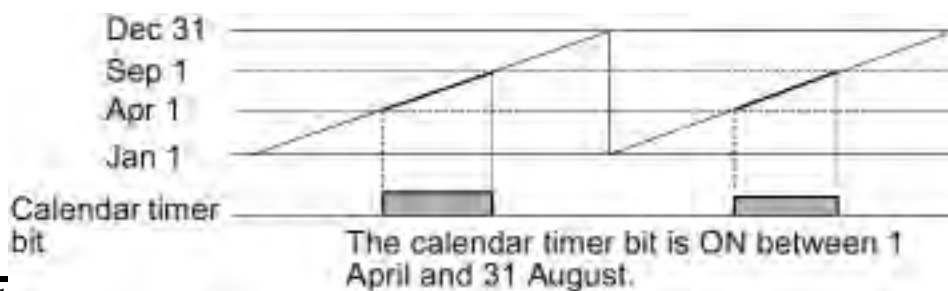
7.4.1. Settings in the Ladder Program

Calendar timer inputs are written in the 'Edit Screen'. Settings are carried out in the parameter settings screen.

Calendar timer address

Output corresponding to Timer
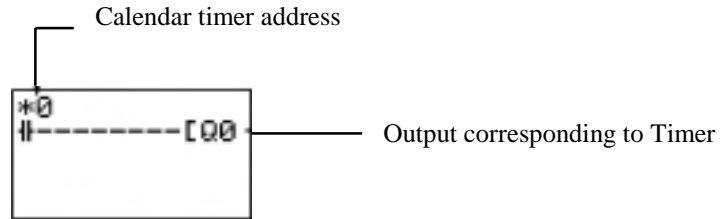
No. of Calendar Timer	*0 to *7

7.4.2. Settings in the Parameter Settings Screen

Calendar timer address

Monitoring enabled/disabled

Start date

Stop date

Start date		Jan 1 to Dec 31
Stop date (see note)		Jan 1 to Dec 31
Monitoring enabled/disabled	A	The parameters can be modified and monitored
	D	The parameters cannot be modified or monitored

Setup and operation		Example	Operation
Start and stop date	When the start date is before the stop date	ON:04/01 OFF: 09/01	Operates between 1 April and 31 August (see note)
	When the start date is after the stop date	ON: 12/26 OFF: 01/07	Operates between 26 December and 6 January of the following year
	When the start and stop dates are the same	ON: 07/26 OFF: 07/26	Operates regardless of the set date

Note.

To stop operation on 31 August, the following day's date (1 September) should be set as the stop date.

7.4.3. Parameter Monitoring in the 'Screen Display'

Current date

Calendar timer bit status
(m:OFF/l:ON)

Start date

Stop date
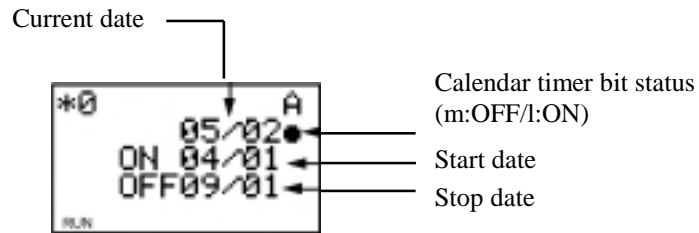
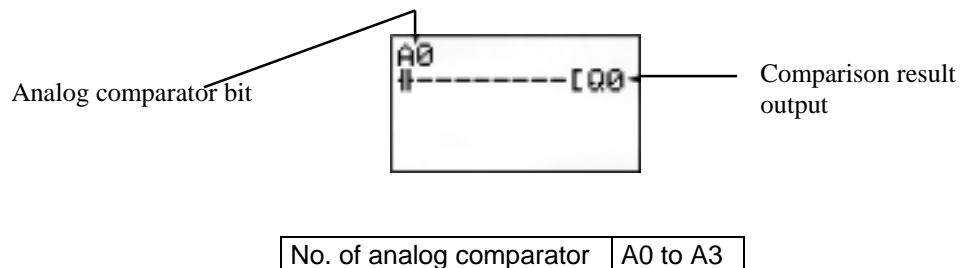## 7.5. Analog Inputs (Analog Comparator (A))

Analog voltage inputs vary between 0 and 10 V. ZEN has 2 analog input points, I4 and I5.

The analog input signal is converted into a BCD value (00.0 to 10.0). The result can be used in one of the CPU comparators, A0 to A3, and the 4 comparison outputs can be used in the program as input conditions.

Analog voltage output device

(0.0 to 10.0 V)

COM   14   15
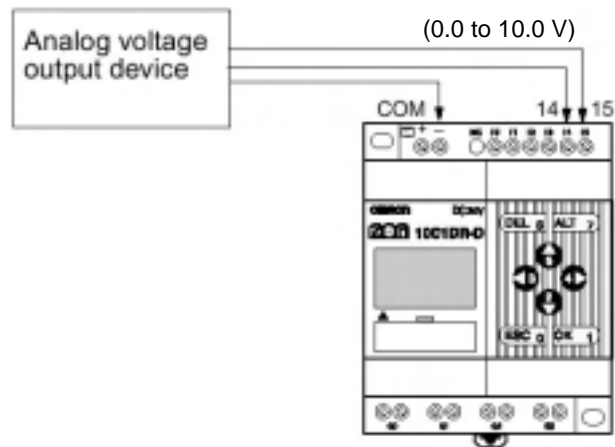
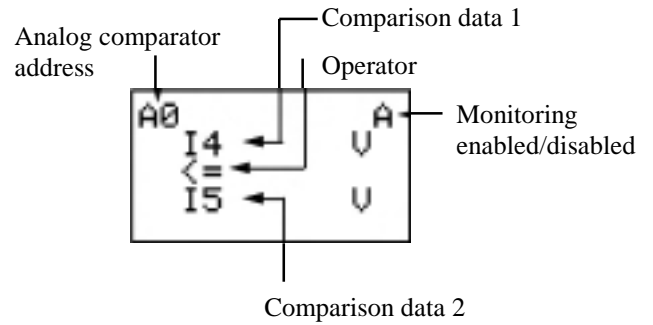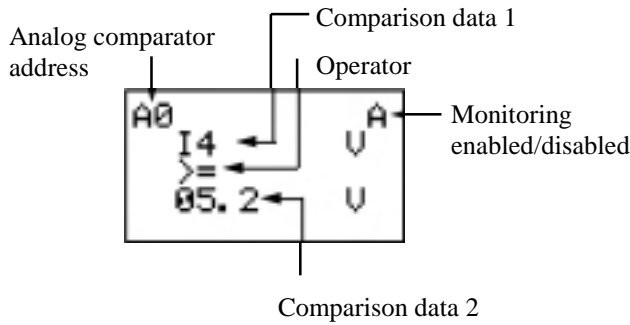## 7.5.1. Settings in the Ladder Program

The analog comparator input is written in the ladder program edit screen. The settings are carried out in the parameter settings screen.

Analog comparator bit

Comparison result output

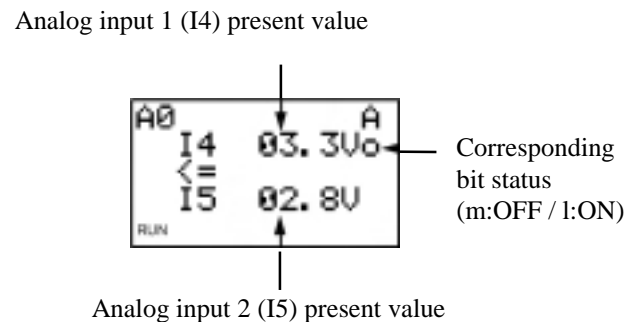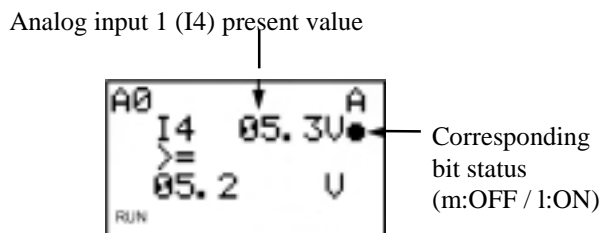| No. of analog comparator	A0 to A3

7.5.2. Settings in the Parameter Settings Screen

- Analog comparison and constant inputs (When I4 ≥ constant)

- Analog input comparisons (When I4 ≤ I5)

Analog comparator address — Comparison data 1 — Operator — Monitoring enabled/disabled

```
A0         A
  I4       V
  >=
  05.2     V
```

Comparison data 2

Analog comparator address — Comparison data 1 — Operator — Monitoring enabled/disabled

```
A0         A
  I4       V
  <=
  I5       V
```

Comparison data 2

No. of analog comparator		A0 to A3	
Comparison data	1	I4: Analog input 1 I5: Analog input 2	* Comparison possible between I4 and I5, I4 and constant and I5 and constant
	2	I5: Analog input 2 Constant: 00.0 to 10.5	
Operator		≥: The corresponding bit switches to ON mode when comparative data 1 ≥ comparative data 2 ≤: The corresponding bit switches to ON mode when comparative data 1 ≤ comparative data 2	
Monitoring enabled/disabled	A	Parameters can be modified and monitored	
	D	Parameters cannot be modified or monitored	

7.5.3. Parameter Monitoring in 'Screen Display'

- Analog input 14 and constant comparisons (When I4 ≥ constant)

- Analog inputs comparison (When I4 ≤ I5)

Analog input 1 (I4) present value

```
A0          A
  I4  05.3V●
  >=
  05.2      V
RUN
```

Corresponding bit status (m:OFF / l:ON)

Analog input 1 (I4) present value

```
A0          A
  I4  03.3Vo
  <=
  I5  02.8V
RUN
```

Corresponding bit status (m:OFF / l:ON)
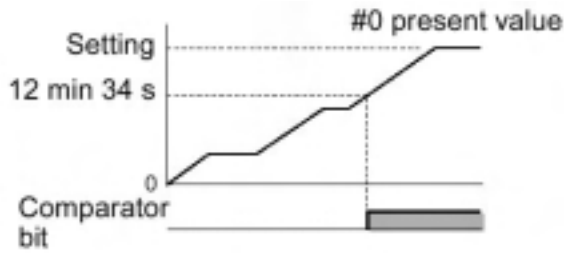
Analog input 2 (I5) present value

7.6. Comparing Timer/Counter Present Values Using Comparators (P)

Timer (T), holding timer (#) and counter (C) present values can be compared. Present values of the same type of timers or counters can be compared. They can also be compared with constants.
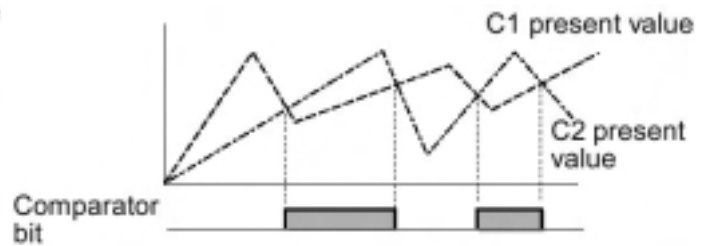
- **Example 1**
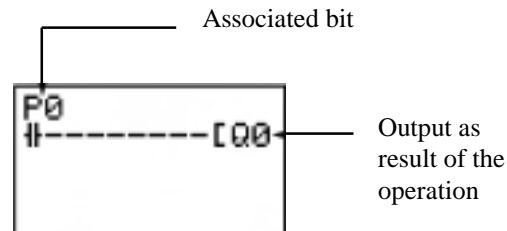 When the holding timer #0 $\geq$ 12 min 34 s

- **Example 2**
  When counter 1 (C1) $\leq$ counter 2 (C2)
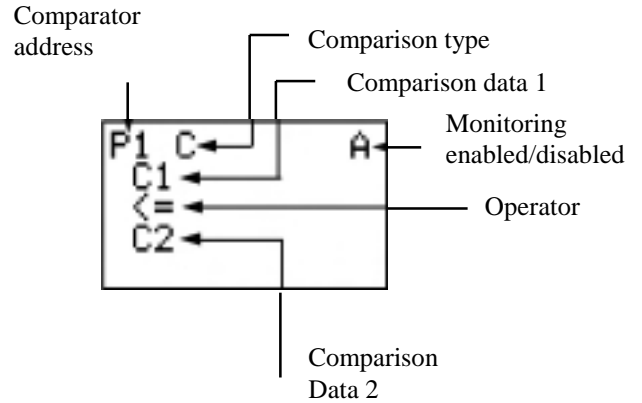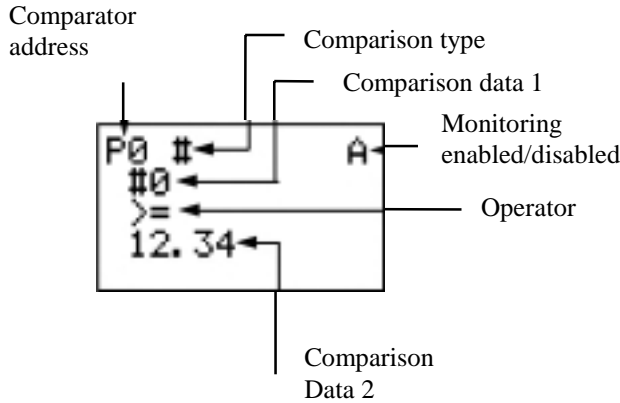
7.6.1. Settings in the Ladder Program

The comparator inputs are written in the ladder program edit screen. The settings are carried out in the parameter settings screen.

| No. of comparators | P0 to P5 |

7.6.2. Settings in the Parameter Settings Screen

- Comparison of holding and constant timers (When the holding timer #0 ≥ 12 min 34 s)

- Comparison of counters (When counter 1 (C1) ≤ counter 2 (C2)

Comparator address

Comparison type

Comparison data 1

Monitoring enabled/disabled

Operator

Comparison Data 2

Comparator address

Comparison type

Comparison data 1

Monitoring enabled/disabled

Operator

Comparison Data 2

Comparison type		T: Timer #: Holding timer C: Counter	
Comparison data	1	T: T0 toT7 #: #0 to #3 C: C0 to C7	Comparison possible between T and T or T and the constant Comparison possible between # and # or # and the constant Comparison possible between C and C or C and the constant
	2	T: T0 to T7 #: #0 to #3 C: C0 to C7 Constant: 00.00 to 99.99 when the comparison type is T / #. 0000 to 9999 when the comparison type is C	
Operator		≥: The corresponding timer/counter bit switches to ON mode when data1≥data2	
		≤: The corresponding timer/counter bit switches to ON mode when data1≤data2	
Monitoring enabled/disabled	A	The parameters can be modified and monitored	
	D	The parameters cannot be modified or monitored	

Note. To enter the data as **constant**, press ALT.
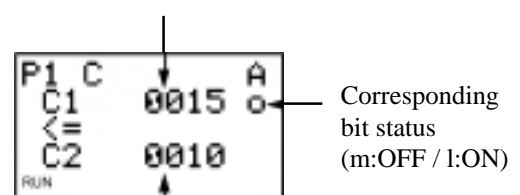
7.6.3. Parameter Monitoring in the 'Screen Display'

- Comparison of holding timer #0 and the constant (When #0 ≥ 12 min 34)

- Comparison of counters (When counter 1 (C1) ≤ counter 2 (C2)

Analog input 1 (I4) present value

Analog input 1 (I4) present value

Corresponding bit status (m:OFF / l:ON)

Corresponding bit status (m:OFF / l:ON)
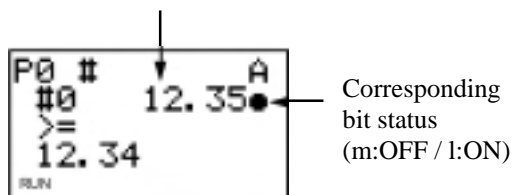
Analog input 2 (I5) present value

Note.

1. Press the ALT key to switch comparative data 2 between the Timer/Counter and the constant.
2. The specification of the time unit can be determined with the type of Timer/Holding Timer comparison:

   a) When a constant has been set as data2, the time unit adjusts automatically to the set unit in data1.
   b) When the time unit is different for both data, it adjusts automatically.

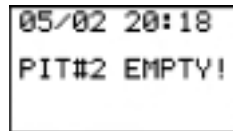# 7.7. Displaying Messages (Display Bits (D))

A series of predefined messages, such as the date and the time, timer/counter present values, analog converted values, etc. can be displayed on the LCD screen. Multiple message displays can also be shown on the same screen.

- **Example 1**
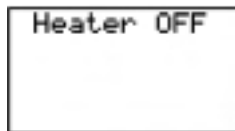
- **Example 2**

```
Heater OFF
```

```
05/02 20:18
PIT#2 EMPTY!
```

Monitors operating system status

Shows the date and time when the error occurred

Settings details

Settings details

```
D0  L2      A
TRG    X01Y0
(00)    CHR
[>_!][Heate]
```

```
D0  L3      A
TRG    X00Y0
(00)    DAT
[>_!][     ]
```
```
D1  L3      A
TRG    X06Y0
(00)    CLK
[>_!][     ]
```
```
D2  L3      A
TRG    X00V2
(00)    CHR
[>_!][PIT#2]
```
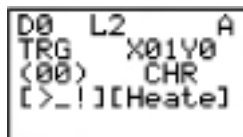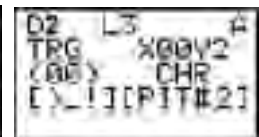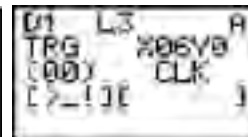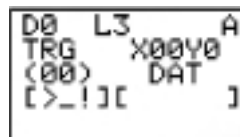
7.7.1. Settings in the Ladder Program

The message viewer is written in the ladder program edit screen. The settings are carried out in the parameter settings screen.

Run condition

```
I0
#--------DD0
```
Display function

| Display No. | D0 to D7 |

7.7.2. Settings in the Parameter Settings Screen

Display No.

Display selector

Monitoring enabled/disabled
Display start position
Display object
Display the character string (set when the character string is selected as the display object)

Character selection for alphanumeric strings

Character string cursor position

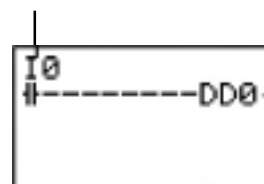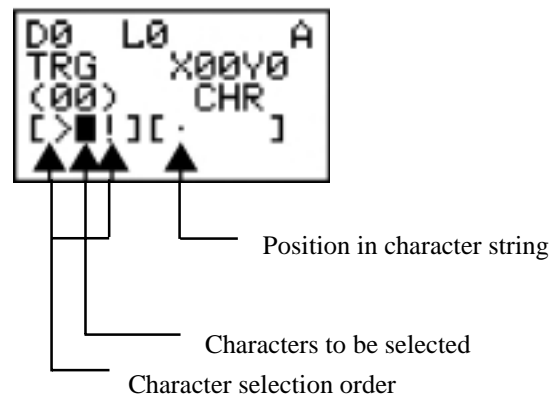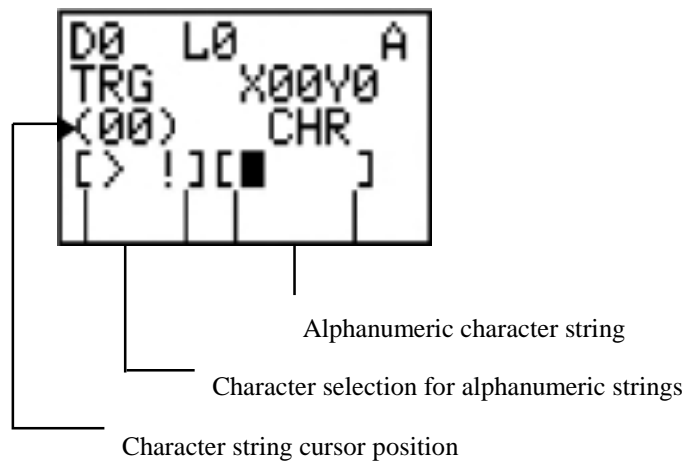| Backlight/display function selection	L0	No backlight. No switching to show Display function (see note 1)
	L1	Backlight. No switching to show Display function (see note 1)
	L2	No backlight. Switching to show Display function (see note 2)
	L3	Backlight. Switching to show Display function (see note 2))
Display start position	X (digit): 00 to 11 Y (digit): 0 to 3	
Display object	CHR	Characters (12 max.: Alphanumeric and symbols)
	DAT	Month/Day (5 digits: @@ / @@)
	CLK	Hours/Minutes (5 digits: @@ / @@)
	I4 to I5	Analog conversion (4 digits: @@ . @)
	T0 to T7	Timer present value (5 digits: @@ . @@)
	#0 to #3	Holding timer present value (5 digits: @@ . @@)
	C0 to C7	Counter present value (4 digits: @@ @@)
Monitoring enabled/disabled	A	The parameters can be modified and monitored
	D	The parameters cannot be modified nor monitored

Note.

1. When either L0 or L1 are selected to disable the display function, this funcion will not automatically be displayed on screen. Use the operating keys to see the display screen.

2. When either L2 or L3 are selected (toggle to show the display function), ZEN is able to show the display screen if this function has been enabled. If everything is correct, the required data will be displayed.

Alphanumeric Character String (CHR) Settings

```
D0   L0         A
TRG      X00Y0
(00)     CHR
[> !][■      ]
```

Alphanumeric character string

Character selection for alphanumeric strings

Character string cursor position

```
D0   L0         A
TRG      X00Y0
(00)     CHR
[>■!][·      ]
```

Position in character string

Characters to be selected

Character selection order

Use the Up/Down keys to scroll through the alphanumeric characters.

The selected character can be positioned to the left of the message using the left cursor key while the same character can be positioned to the right of the message using the right cursor key.
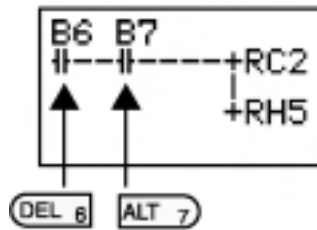
7.8. Using the Cursor Keys (B)

When the CPU displays the LCD screen, the operating keys can be used for bit testing operations:

Cursor key address	Operating key
B0	ESC
B1	OK
B2	Down
B3	Left
B4	Right
B5	Out
B6	DEL
B7	ALT
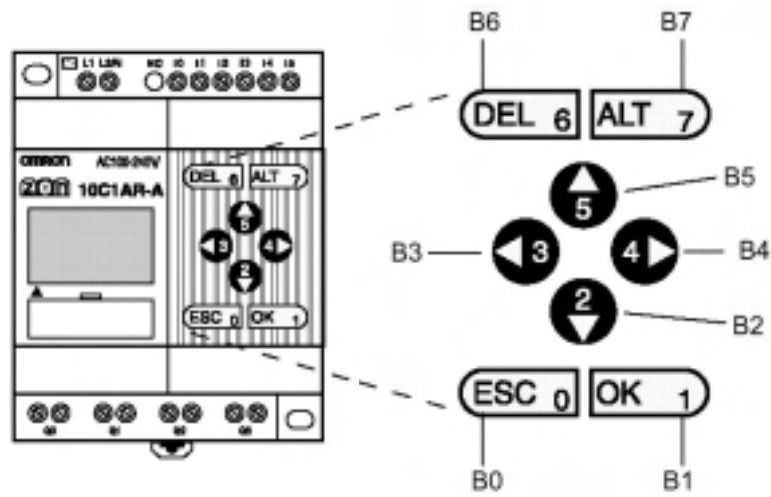
Using cursor keys

By holding down the DEL+ALT keys, the counter C2 and H5 holding bit present values can be reset.

8. Troubleshooting

If there is an error of any kind during the operation, the error message will be displayed on screen (if the CPU is LCD type) or the ERROR indicator will be enabled (if the CPU is LED type).

8.1. Error Messages

The following table shows the list of error messages which can occur in the unit when there is an error:

Powered CPU but not in RUN mode

Error message	Cause	Possible solution
MEMORY ERR	Program error	The ladder program and the parameter settings have been cleared. Write new program in ZEN.
I/O BUS ERR	Connection error in the I/O expansion unit	Switch off power supply and check that the expansion units are connected correctly.
UNIT OVER	More than 3 I/O expansion units connected	Switch off power supply and reduce the number of I/O expansion units (3 or less).
I/O VRFY ERR	The type of bit set in the program cannot be used by the system	Change the wrong bit type in the program.

Note. I/O Verify Error

I/O (X/Y) bits in I/O expansion units: non addressable bits have been used.

Analog comparators (A): used with AC power supply.

Weekly (@) / Calendar (*) Timers: used in ZEN without clock/calendar function.

Display function (D):
• The converted analog values (14/15) for AC CPUs are specified as in the list.
• The date (DAT) and the time (CLK) for CPUs without calendar/clock function are specified as in the list.

Error at power ON or during execution

Error message	Cause	Possible solution
I/O BUS ERR	Connection error in the I/O expansion unit	Switch off the power supply and check that the expansion unti is connected correctly.
MEMORY ERR	Program error	Execute the 'All Clear' operation and rewrite the program.
I2C ERR	Communication error between Memory and RTC	Press any key and clear the error.

Error during program transfer from Memory Cassette

Error message	Cause	Possible solution
M/C ERR	Error in the cassette program	Save the error-free program on the cassette

Note. Use ZEN Support Software to read the error messages for LED-type CPUs.

9. Accessories

9.1. Battery

The ladder program and all settings are saved on the CPU EEPROM unit, but the calendar, clock, holding timer bits and the timer/counter present values are held by the unit capacitor.

In the case of power supply failure, the data can be stored in the CPU for approximately 2 days (at 25° C) until they are reset.

Installation method:

1. Lean the ZEN-BAT01 battery unit over to one side and insert the clip into the space provided on the left-hand side of the CPU.
2. Connect the battery cable to the CPU connector.
3. And drag the battery clip towards the CPU.

Note. Disconnect the power supply before assembling the battery unit.
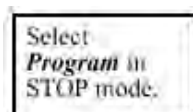
9.2. Memory Cassette

Memory Cassettes can also be connected to ZEN to save ladder programs and settings and to copy these ladder programs onto other CPU units.
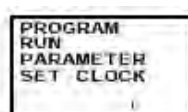
Installation method:

1. Remove the cover from the CPU front connector
2. Connect the ZEN-ME01 memory cassette

Note. Disconnect the power supply before mounting or removing the memory cassette.
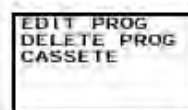
Program Transfer
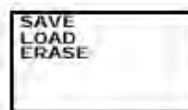
|		
Select *Program* in STOP mode.	PROGRAM RUN PARAMETER SET CLOCK	In STOP mode, select PROGRAM and then CASSETTE.
	EDIT PROG DELETE PROG CASSETE	Select 'Cassette'.
	SAVE LOAD ERASE	The Memory Cassette Menu options will appear and by using the Up/Down keys, select the following options.

Menu	Operation
Save	Transfers the CPU program to the Memory Cassette. Any program already in the cassette will be overwritten.
Load	Transfers the Memory Cassette program to the CPU. Any program already in the CPU will be overwritten.
Erase	Clears the program from the Memory Cassette.

Note.
1. Program transfer includes the ladder program, parameters and all data settings. Normal and holding timers, counters and holding bits present values cannot be transferred.
2. Only error-free programs can be transferred. The program will not be transferred if it contains any type of error.
3. The memory cassette allows 100,000 writes.

9.3. Connecting the ZEN Support Software

The Software can be used either for ZEN programming or for monitoring. For further information about the functions or operations, see the 'ZEN-SOFT01 ZEN Support Software Operation Manual' (W386).
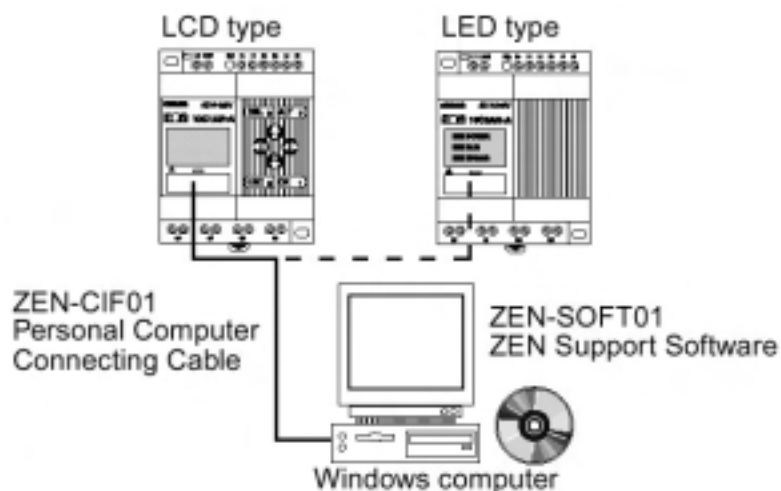

	Conditions
Operating System	Windows 95, 98, ME, 2000, NT 4.0 Service Pack 3
CPU	Pentium 133 MHz or higher
Memory	64 Mbytes min.
Hard disc	40 Mbytes free disc space min.
CD-ROM drive	Required
Communications	Serial port
Keyboard and mouse	Required
Monitor	800x600 dots (SVGA) min. 256 colors min.

Node number setting

When ZEN has to be connected to the Software, the node number displayed both in the Software and the CPU must be identical. Follow the steps below to set the ZEN node number.
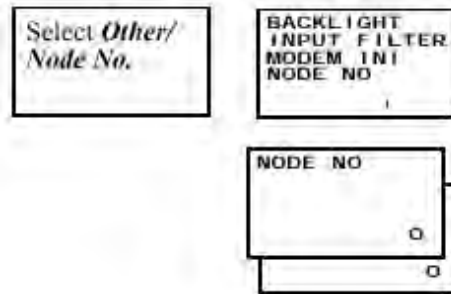
Enter the OTHER option and select NODE No.

Press the OK key to display the Menu.

By pressing the OK key again, the node number setting is enabled.

The node number is selected by using the Up/Down and Left/Right keys.

Press the OK key to confirm.

Press the OK key again to complete the setting.