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Technical description

ADDINUM PA 1000

Standard software/ API functions

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1 INTRODUCTION

i

IMPORTANT!

Note the following conventions in the text:

Function: "i_PA1000_SetBoardInformation"
 Variable *ui_Address*

Table 1-1: Type Declaration for Dos and Windows 3.1X

	Borland C	Microsoft C	Borland Pascal	Microsoft Visual Basic Dos	Microsoft Visual Basic Windows
VOID	void	void	pointer		any
BYTE	unsigned char	unsigned char	byte	integer	integer
INT	int	int	integer	integer	integer
UINT	unsigned int	unsigned int	word	long	long
LONG	long	long	longint	long	long
PBYTE	unsigned char *	unsigned char *	var byte	integer	integer
PINT	int *	int *	var integer	integer	integer
PUINT	unsigned int *	unsigned int *	var word	long	long
PCHAR	char *	char *	var string	string	string

Table 1-2: Type Declaration for Windows 95/NT

	Borland C	Microsoft C	Borland Pascal	Microsoft Visual Basic Dos	Microsoft Visual Basic Windows
VOID	void	void	pointer		any
BYTE	unsigned char	unsigned char	byte	integer	integer
INT	int	int	integer	integer	integer
UINT	unsigned int	unsigned int	long	long	long
LONG	long	long	longint	long	long
PBYTE	unsigned char *	unsigned char *	var byte	integer	integer
PINT	int *	int *	var integer	integer	integer
PUINT	Unsigned int *	unsigned int *	var long	long	long
PCHAR	Char *	char *	var string	string	string

Table 1-3: Define value



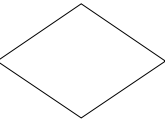
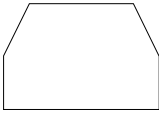

Define name	Decimal value	Hexadecimal value
DLL_COMPILER_C	0	0
DLL_COMPILER_VB	1	1
DLL_COMPILER_PASCAL	2	2
DLL_LABVIEW	3	3
DLL_COMPILER_VB_5	4	4
PA1000_DISABLE	0	0
PA1000_ENABLE	1	1
PA1000_AND	2	2
PA1000_OR	4	4
PA1000_OR_PRIORITY	6	6
PA1000_8BIT	8	8
PA1000_16BIT	16	10
PA1000_TIMER	0	0
PA1000_COUNTER	32	20
PA1000_SINGLE	0	0
PA1000_CONTINUOUS	128	80
PA1000_SOFTWARE_TRIGGER	4	4
PA1000_HARDWARE_TRIGGER	16	10
PA1000_SOFTWARE_GATE	0	0
PA1000_HARDWARE_GATE	8	8

2 DIN 66001- GRAPHICAL SYMBOLS

This chapter describes all software functions (API) necessary for the operation of the **PA 1000** board.

To illustrate these functions, we designed flow charts with the graphical symbols listed below.

It gives the user a quick overview of the hierarchy between the different functions.

	<p>Process, general (including inputs and outputs)</p>
	<p>Terminator (eg. Beginning or end of a sequence, origin or place of data)</p>
	<p>Decision Selection unit (eg.: switch)</p>
	<p>Loop limit Beginning</p>
	<p>Loop limit End</p>

3 SOFTWARE FUNCTIONS (API)

3.1 Initialisation

1) i_PA1000_InitCompiler (..)

Syntax:

<Return value> = i_PA1000_InitCompiler (BYTE b_CompilerDefine)

Parameters:

- Input:

BYTE b_CompilerDefine

The user has to choose the language under Windows in which he/she wants to program

- DLL_COMPILER_C:

The user programs in C.

- DLL_COMPILER_VB:

The user programs in Visual Basic for Windows.

- DLL_COMPILER_VB_5:

The user programs in Visual Basic 5.0.

- DLL_COMPILER_PASCAL:

The user programs in Pascal or Delphi.

- DLL_LABVIEW :

The user programs in Labview.

- Output:

No output signal has occurred.

Task:

If you want to use the DLL functions, parameter in the language in which you want to program. This function must be the first to be called up.

i

IMPORTANT!

This function is only available with a Windows environment.

Calling convention:

ANSI C:

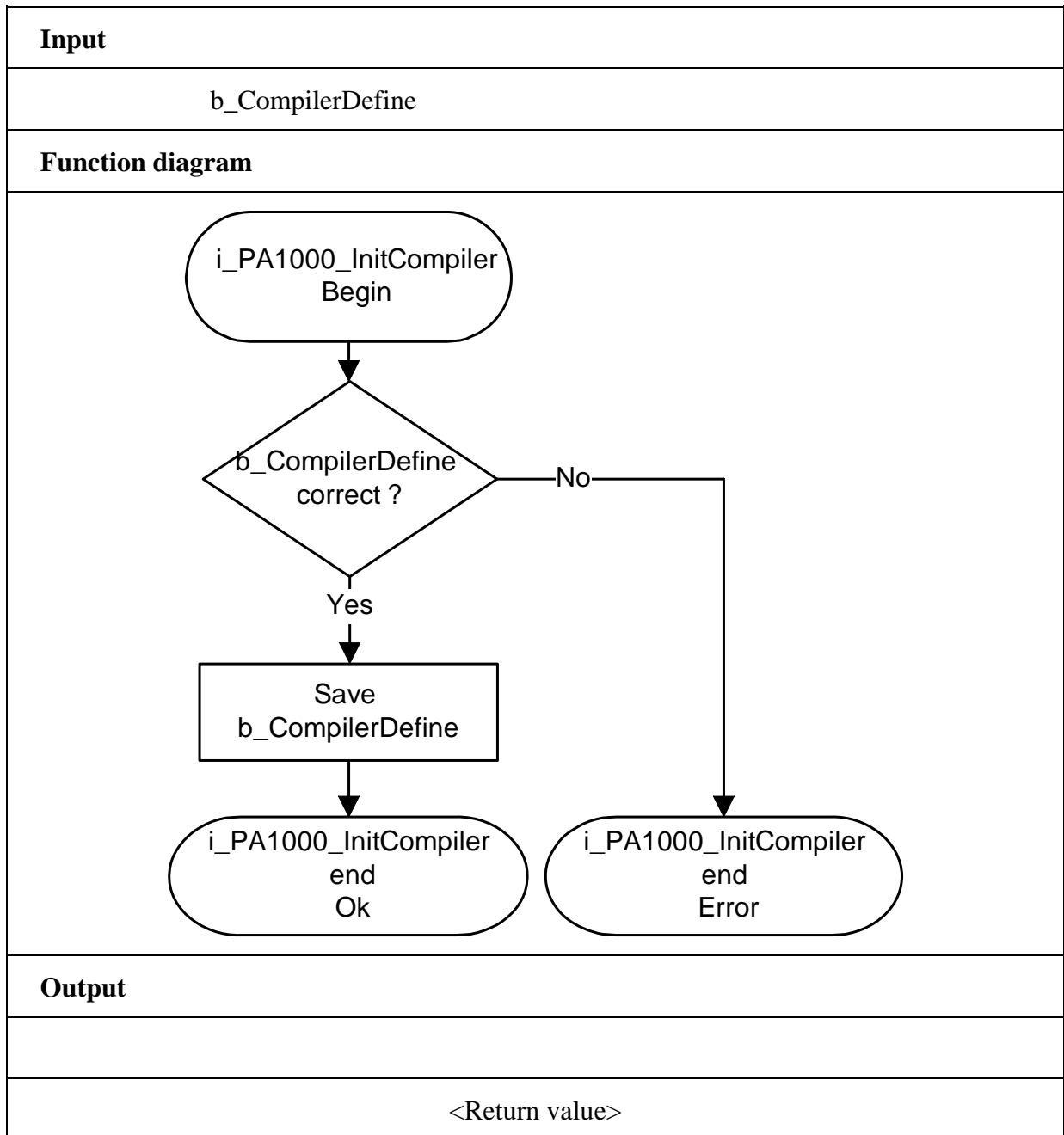
```
int i_ReturnValue;
```

```
i_ReturnValue = i_PA1000_InitCompiler (DLL_COMPILER_C);
```

Return value:

0: No error

-1: Compiler parameter is wrong



i**IMPORTANT!**

This function is only available for DOS and Windows 3.11 applications

2) i_PA1000_SetBoardInformation (..)**Syntax:**

```
<Return value> = i_PA1000_SetBoardInformation (UINT ui_BaseAddress,
                                                BYTE b_AccessMode,
                                                BYTE b_InterruptNbr,
                                                PBYTE pb_BoardHandle)
```

Parameters:**- Input:**

UINT	ui_BaseAddress	Base address of PA1000 board
BYTE	b_AccessMode	Hardware access mode PA1000_8BIT: 8-bit access mode PA1000_16BIT: 16-bit access mode
BYTE	b_InterruptNbr	PA 1000 interrupt number (3, 5, 10, 11, 12, 14 or 15). If 0, no interrupt is used

- Output:

PBYTE	pb_BoardHandle	Handle ¹ of board PA1000 to use the functions
-------	----------------	--

Task:

Verifies if the board **PA1000** is present. Stores the following information:

- the base address,
- the hardware access mode,
- the interrupt number.

A handle is returned to the user which allows to use the next functions.

Handles allow to operate several boards.

Calling convention:

ANSI C :

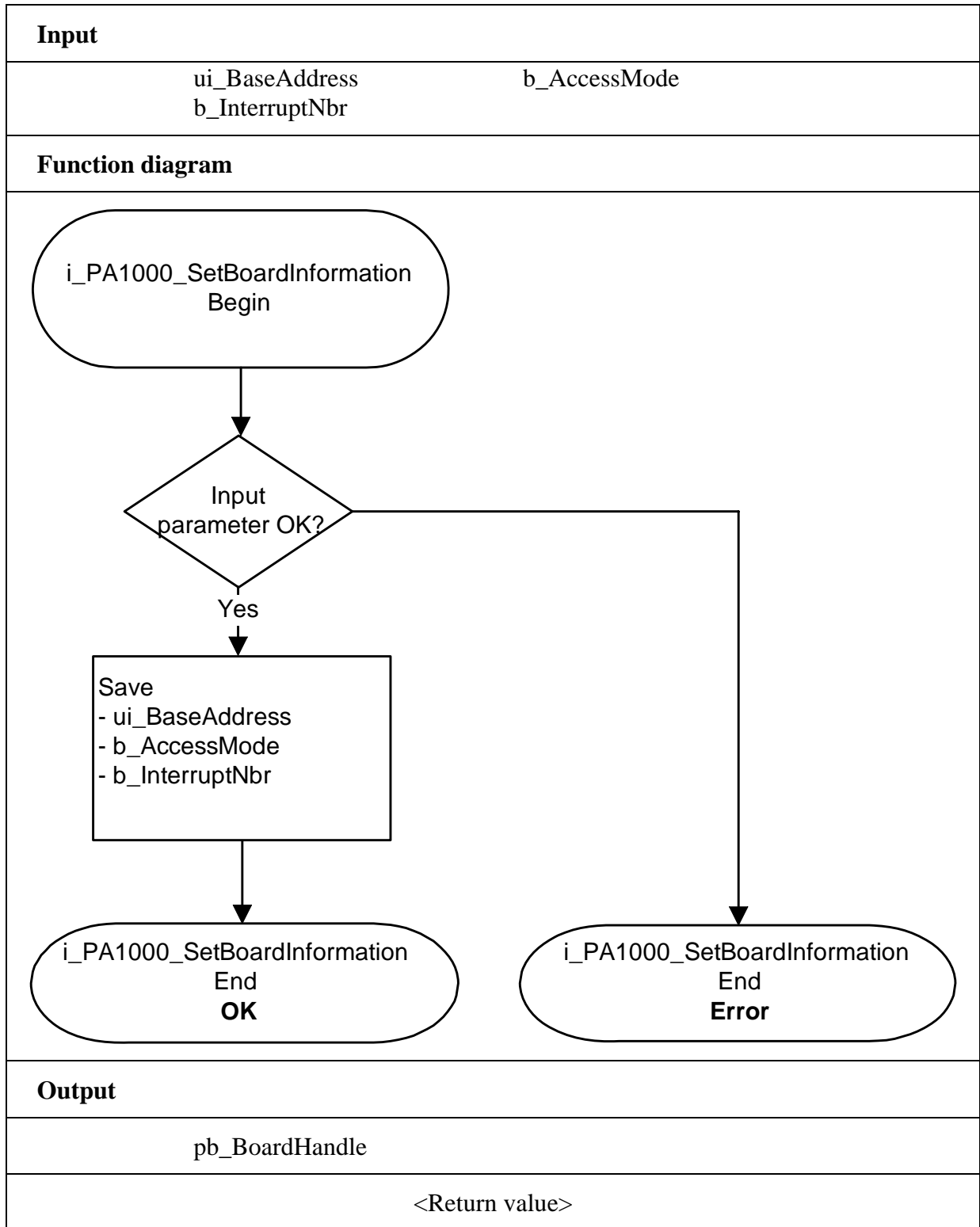
```
int          i_ReturnValue;
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_SetBoardInformation (0x300,
                                                PA1000_16BIT,
                                                0,
                                                &b_BoardHandle);
```

Return value:

- 0: No error
- 1: Board not present
- 2: Access mode parameter is wrong
- 3: Interrupt number is wrong or already used by another **PA1000**
- 4: No handle is available for the board (up to 10 handles can be used)

¹ Identification number of the board



i**IMPORTANT!**

This function is only available for Windows NT / 95 applications

3) i_PA1000_SetBoardInformationWin32 (...)**Syntax:**

```
<Return value> = i_PA1000_SetBoardInformationWin32
                    (PCHAR      pc_Identifier
                    BYTE        b_AccessMode,
                    PBYTE       pb_BoardHandle)
```

Parameters:**- Input:**

PCHAR	pc_Identifier	Identifier string for the selection of PA 1000 . The identifier string is determined by the ADDIREG registration program.
BYTE	b_AccessMode	Hardware access mode PA1000_8BIT: 8-bit access mode PA1000_16BIT: 16-bit access mode

- Output:

PBYTE	pb_BoardHandle	Handle of the board PA 1000 to use the functions
-------	----------------	---

Task:

Calls up all hardware information about the **PA 1000** given by the ADDIREG registration program and stores the following information:

- the base address,
- the interrupt number.

Then verifies if board **PA 1000** is present.

A handle is returned to the user which allows to use the next functions.
Handles allow to operate several boards.

Calling convention:

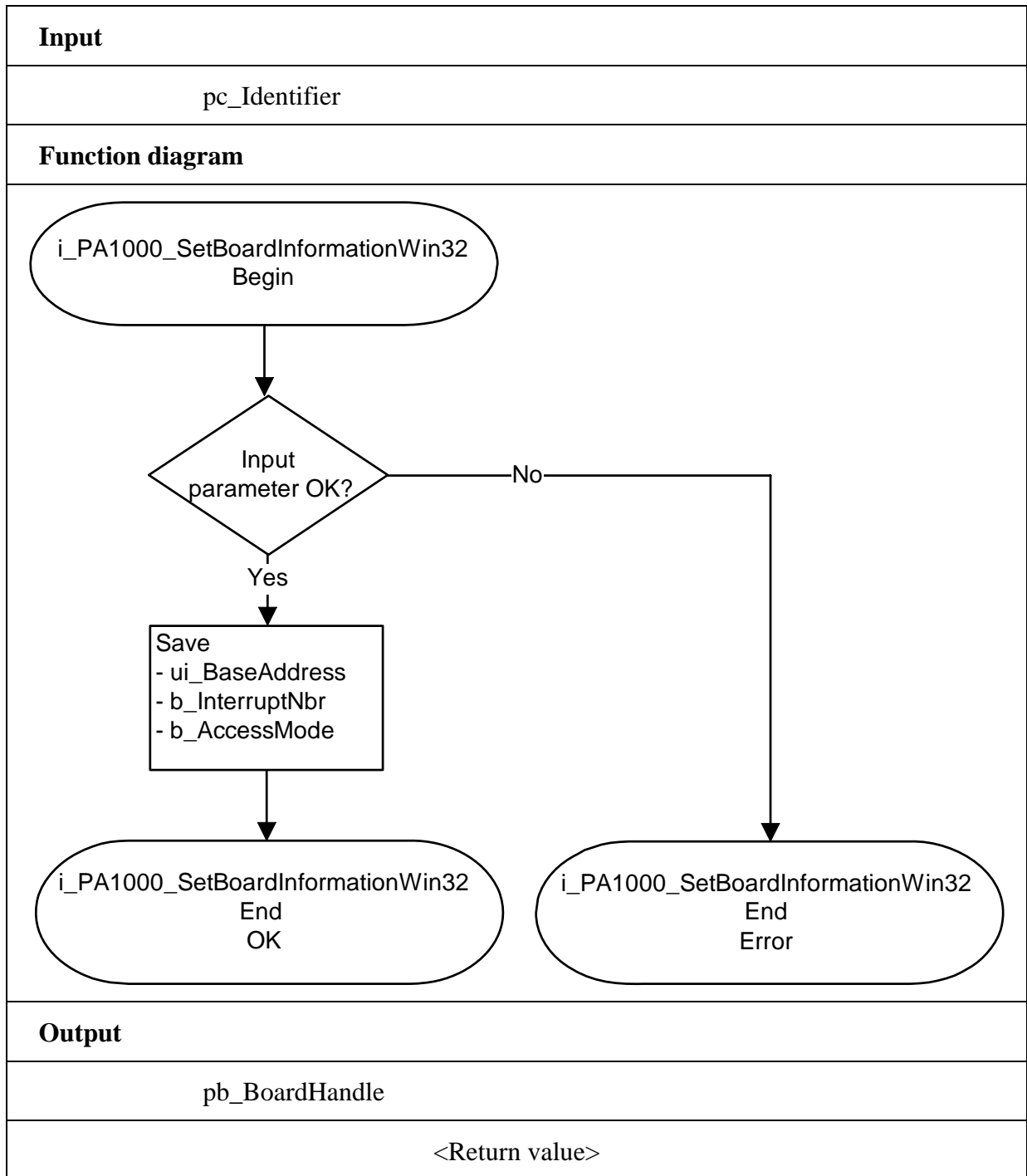
ANSI C:

```
int          i_ReturnValue;
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_SetBoardInformationWin32
                ("PA1000-00", &b_BoardHandle);
```

Return value:

- 0: No error
- 1: Board not present
- 2: Access mode parameter is wrong
- 3: No handle is available for the board (up to 10 handles can be used)
- 4: Error by opening the driver under Windows NT/95



4) i_PA1000_GetHardwareInformation (...)**Syntax:**

```
<Return value> = i_PA1000_GetHardwareInformation
                                     (BYTE   b_BoardHandle,
                                     PUINT   pui_BaseAddress,
                                     PBYTE   pb_InterruptNbr)
```

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

PUINT pui_BaseAddress Base address of the **PA 1000**

PBYTE pb_InterruptNbr Interrupt line of the **PA 1000**.

Task:

Returns the base address, the interrupt and DMA number of the **PA 1000**.

Calling convention:

ANSI C:

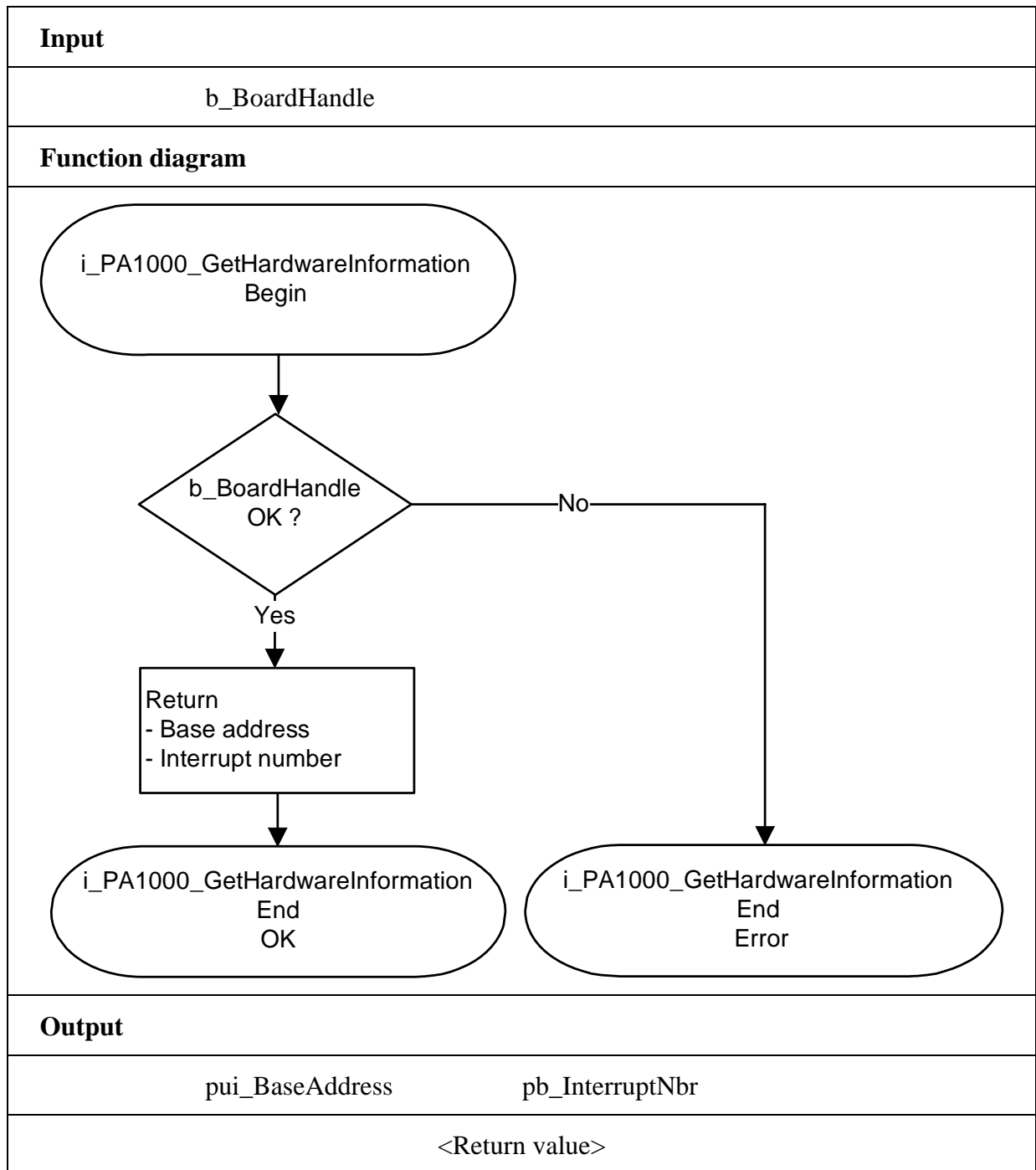
```
int                    i_ReturnValue;
unsigned int        ui_BaseAddress;
unsigned char        b_InterruptNbr;
unsigned char        b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_GetHardwareInformation (b_BoardHandle,
                                                  &ui_BaseAddress,
                                                  &b_InterruptNbr);
```

Return value:

0: No error

-1: The handle parameter of the board is wrong



5) i_PA1000_CloseBoardHandle

Syntax:

<Return value> = i_PA1000_CloseBoardHandle (BYTE b_BoardHandle)

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred.

Task:

Releases the board handle. Blocks the access to the board.

Calling convention:ANSI C:

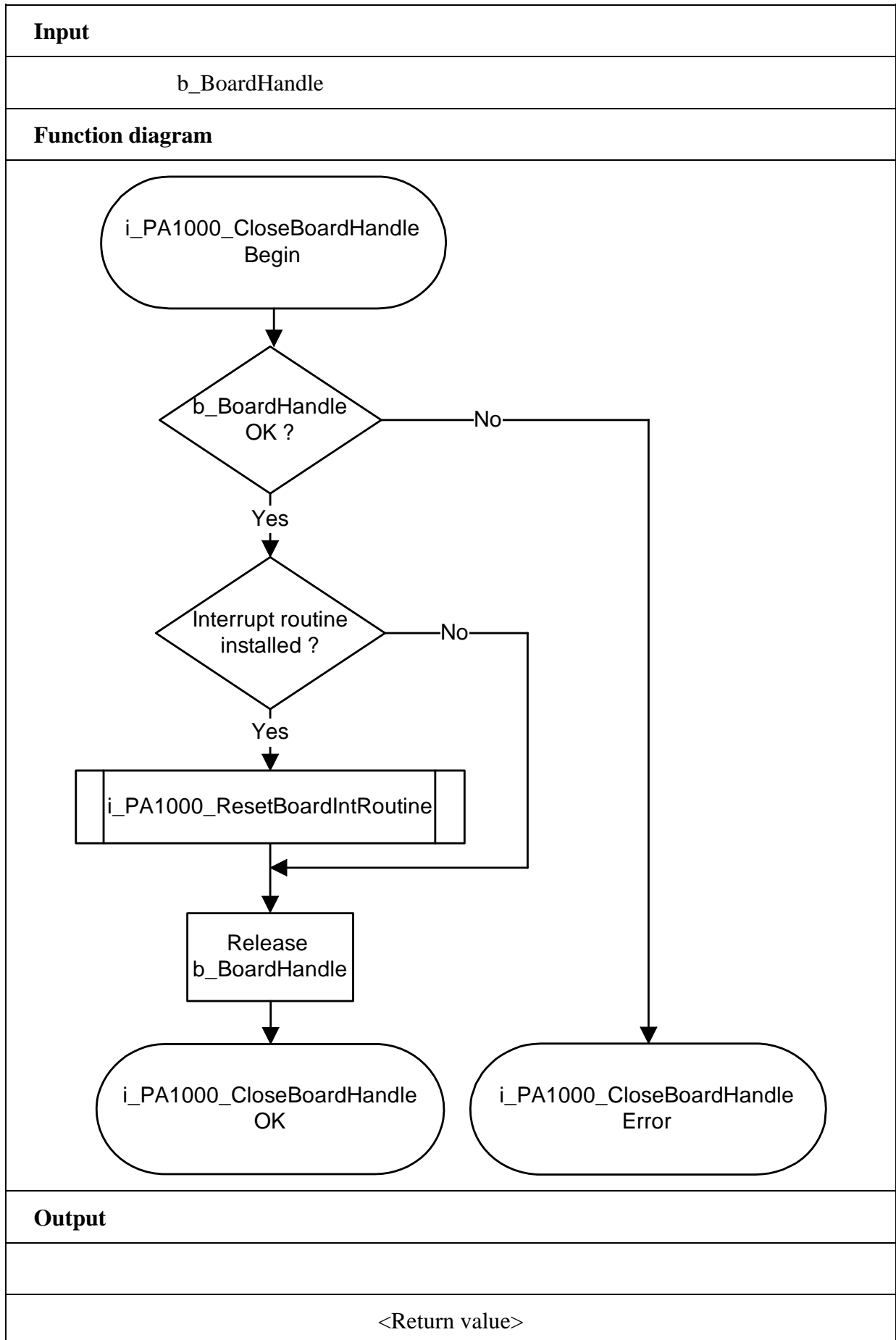
```
int                      i_ReturnValue;  
unsigned char    b_BoardHandle;
```

```
    i_ReturnValue = i_PA1000_CloseBoardHandle (b_BoardHandle);
```

Return value:

0: No error

-1: The handle parameter of the board is wrong



3.2 Interrupt

i

IMPORTANT!

This function is only available for applications in C/C++ and Pascal for DOS

1) `i_PA1000_SetBoardIntRoutineDos` (..)

Syntax:

```
<Return value> = i_PA1000_SetBoardIntRoutineDos
                    (BYTE   b_boardHandle
                    VOID    v_FunctionName
                    (BYTE   b_BoardHandle,
                     BYTE   b_InterruptMask,
                     BYTE   b_InputChannelNbr))
```

Parameters:

- Input:

BYTE	b_BoardHandle	Handle of board PA 1000
VOID	v_FunctionName	Name of the user interrupt routine

- Output:

No output signal has occurred

Task:

This function must be called up for each **PA 1000** on which an interrupt action is to be enabled.

First calling (first board):

- the user interrupt routine is installed
- interrupts are enabled.

If you operate several boards **PA 1000** which have to react to interrupts, call up the function as often as you operate boards **PA 1000**.

The variable *v_FunctionName* is only relevant **for the first calling**.

From the second call of the function (next board):

- interrupts are enabled.

Interrupt

The user interrupt routine is called up by the system when an interrupt is generated.

If several boards are operated and if they have to react to interrupts, the variable *b_BoardHandle* returns the identification number (handle) of the board which has generated the interrupt.

The user interrupt routine must have the following syntax:

```
VOID v_FunctionName (BYTE b_BoardHandle,
                    BYTE b_InterruptMask,
                    BYTE b_InputChannelNbr)
```

v_FunctionName Name of the user interrupt routine
b_BoardHandle Handle of the **PA 1000** which has generated the interrupt
b_InterruptMask Mask of the events which have generated the interrupt.
b_InputChannelNbr If an interrupt is generated with a Mask 0000 0001 and if you use the OR-PRIORITY logic, this variable gives the input number which have generated the interrupt.

Table 9-3: Interrupt mask

Mask	Meaning
0000 0001	Event 1 has occurred
0000 0010	Event 2 has occurred
0000 0100	Counter/timer 1 has run down
0000 1000	Counter/timer 2 has run down
0001 0000	Counter/timer 3 has run down

The user can give another name for *v_FunctionName*, *b_BoardHandle*, *b_InterruptMask*, *b_InputChannelNbr*.

Calling convention:

ANSI C :

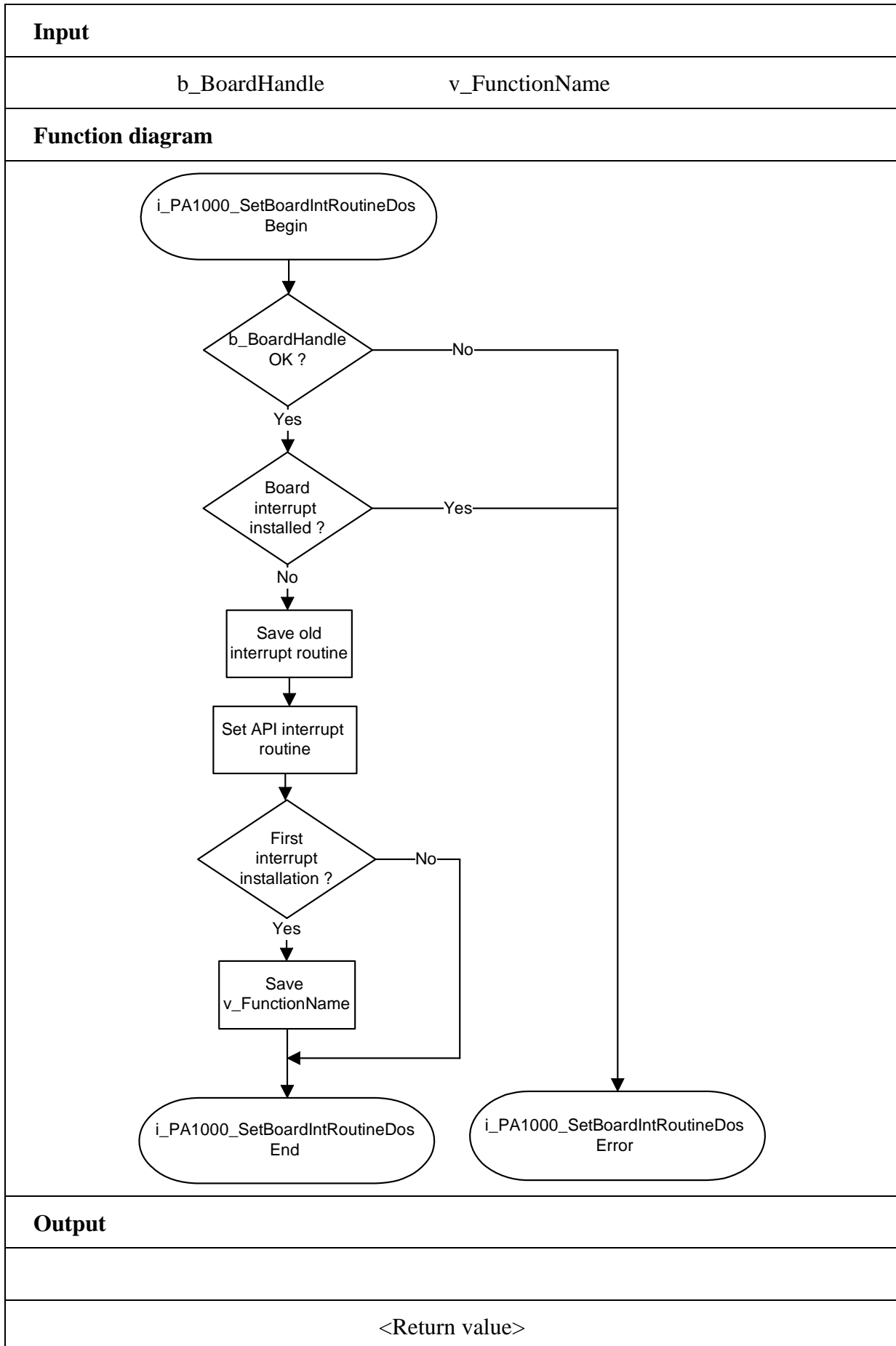
```
void v_FunctionName (unsigned char b_BoardHandle,
                    unsigned char b_InterruptMask,
                    unsigned char b_InputChannelNumber)
{
    .
    .
}

int i_ReturnValue;
unsigned char b_BoardHandle;

i_ReturnValue = i_PA1000_SetBoardIntRoutineDos (b_BoardHandle,
                                                v_FunctionName );
```

Return value:

0: No error
-1: The handle parameter of the board is wrong
-2: Interrupt already installed



i**IMPORTANT!**

This function is only available for Visual Basic DOS.

2) i_PA1000_SetBoardIntRoutineVBDos (.)**Syntax:**

<Return value> = i_PA1000_SetBoardIntRoutineVBDos
(BYTE b_BoardHandle)

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred.

Task:

This function must be called up for each **PA 1000** on which an interrupt is to be enabled. If an interrupt occurs, a Visual basic event is generated. (See calling convention)

When the function is called up for the first time (first board):

- interrupts are allowed for the selected board.

If you operate several boards **PA 1000** which have to react to interrupts, call up the function as often as you operate boards **PA 1000**.

Interrupt

The user interrupt routine is called up by the system when an interrupt is generated.

Controlling the interrupt management

Please use instead the following functions

"ON UEVENT GOSUB xxxxxxxxx" of Visual Basic for DOS

and

"i_PA1000_TestInterrupt"

This function tests the interrupt of the **PA 1000**. It is used to obtain the values of *b_BoardHandle*, *b_InterruptMask*, *b_InputChannelNbr*.

Calling convention:Visual Basic DOS:

```
Dim Shared i_ReturnValue      As Integer
Dim Shared i_BoardHandle     As Integer
Dim Shared i_InterruptMask   As Integer
Dim Shared i_InputChannelNbr As Integer
```

IntLabel:

```
i_ReturnValue = i_PA1000_TestInterrupt (i_BoardHandle, _
                                         i_InterruptMask, _
                                         i_InputChannelNbr)
```

.

.

.

Return

ON UEVENT GOSUB IntLabel

UEVENT ON

```
i_ReturnValue = i_PA1000_SetBoardIntRoutineVBDos (b_BoardHandle)
```

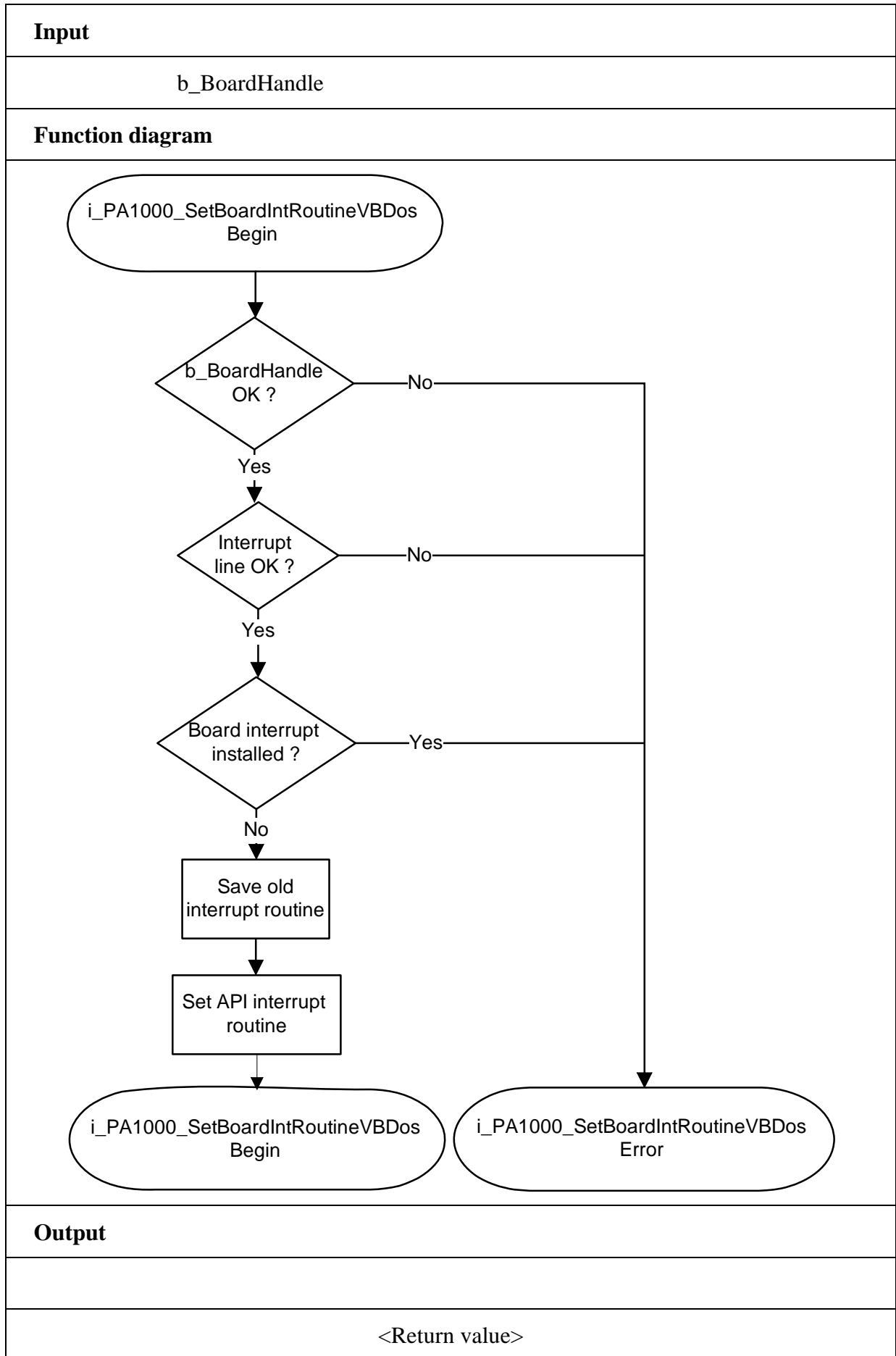
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: No interrupt line initialised

-3: Interrupt already installed



3) i_PA1000_SetBoardIntRoutineWin16**i****IMPORTANT!****This function is only available for Windows 3.1 and 3.11.****Syntax:**

```
<Return value> = i_PA1000_SetBoardIntRoutineWin16
                    (BYTE   b_boardHandle
                    VOID    v_FunctionName
                    (BYTE   b_BoardHandle,
                     BYTE   b_InterruptMask,
                     BYTE   b_InputChannelNbr))
```

Parameters:**- Input:**

BYTE	b_BoardHandle	Handle of board PA 1000
VOID	v_FunctionName	Name of the user interrupt routine

- Output:

No output signal has occurred

Task:

This function must be called up for each **PA 1000** on which an interrupt action is to be enabled.

First calling (first board):

- the user interrupt routine is installed
- interrupts are enabled.

If you operate several boards **PA 1000** which have to react to interrupts, call up the function as often as you operate boards **PA 1000**.

The variable *v_FunctionName* is only relevant **for the first calling**.

From the second call of the function (next board):

- interrupts are enabled.

Interrupt

The user interrupt routine is called up by the system when an interrupt is generated.

If several boards are operated and if they have to react to interrupts, the variable *b_BoardHandle* returns the identification number (handle) of the board which has generated the interrupt.

The user interrupt routine must have the following syntax:

```
VOID  v_FunctionName (BYTE b_BoardHandle,
                    BYTE   b_InterruptMask,
                    BYTE   b_InputChannelNbr)
```

<i>v_FunctionName</i>	Name of the user interrupt routine
<i>b_BoardHandle</i>	Handle of the PA 1000 which has generated the interrupt
<i>b_InterruptMask</i>	Mask of the events which have generated the interrupt.
<i>b_InputChannelNbr</i>	If an interrupt is generated with a Mask 0000 0001 and if you use the OR-PRIORITY logic, this variable gives the input number which have generated the interrupt.

i**IMPORTANT!**

If you use Visual Basic for Windows the following parameter has no meaning. You must use the „i_PA1000_TestInterrupt“ function.

```
VOID v_FunctionName (BYTE b_BoardHandle,
                    BYTE b_InterruptMask,
                    BYTE b_InputChannelNbr)
```

Calling convention:ANSI C:

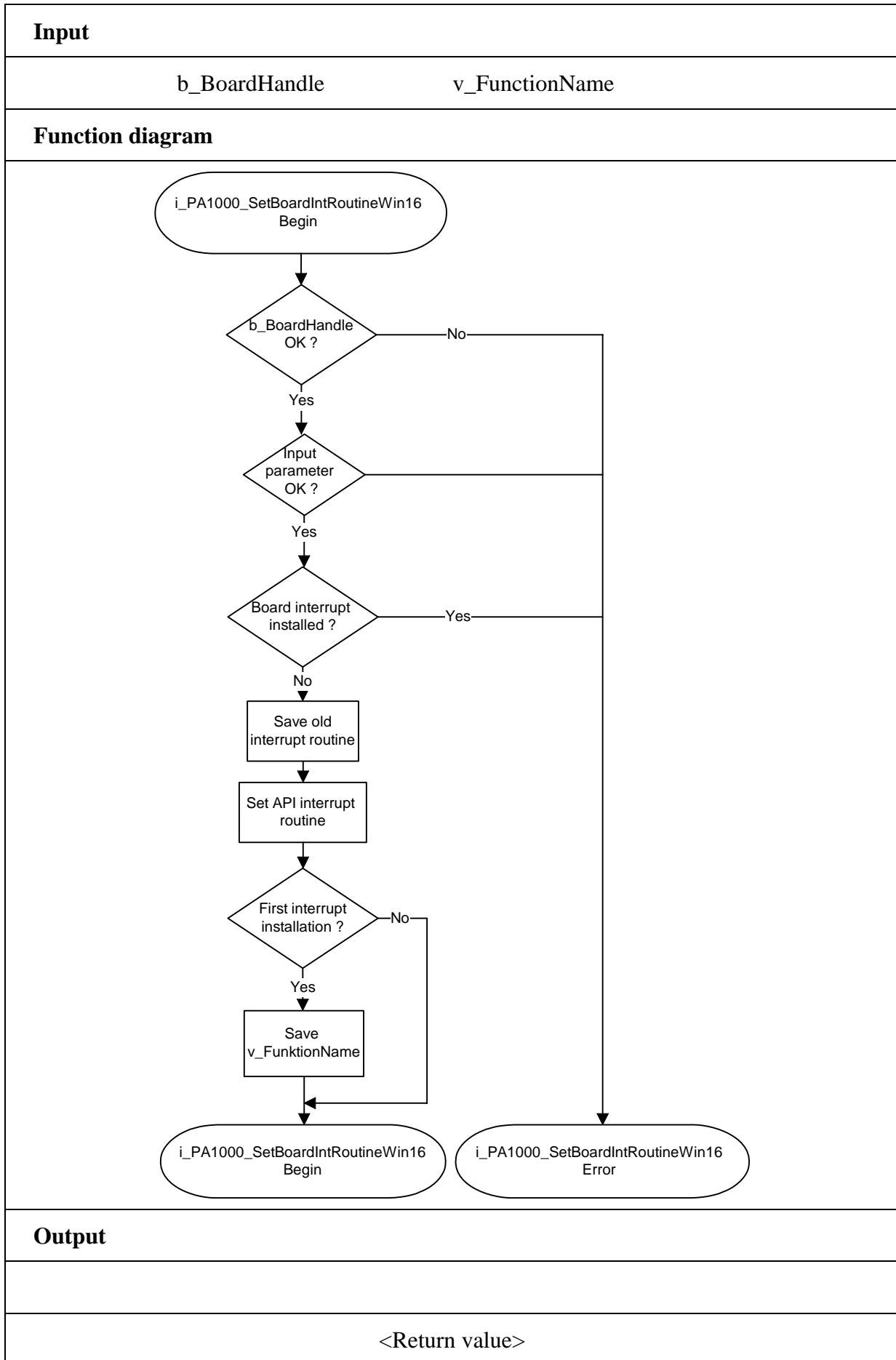
```
void v_FunctionName (unsigned char b_BoardHandle,
                   unsigned char b_InterruptMask,
                   unsigned char b_InputChannelNumber)
{
  .
  .
}
```

```
int i_ReturnValue;
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_SetBoardIntRoutineWin16 (b_BoardHandle,
                                                  v_FunctionName );
```

Return value:

- 0: No error
- 1: The handle parameter of the board is wrong
- 2: Interrupt already installed



i**IMPORTANT!**

This function is only available for Windows NT and Windows 95.

4) i_PA1000_SetBoardIntRoutineWin32 (..)**Syntax:**

```
<Return value> = i_PA1000_SetBoardIntRoutineWin32
    (BYTE      b_BoardHandle,
     BYTE      b_UserCallingMode,
     ULONG     ul_UserSharedMemorySize,
     VOID **   ppv_UserSharedMemory,
     VOID      v_FunctionName (BYTE      b_BoardHandle,
                               BYTE      b_InterruptMask,
                               BYTE      b_InputChannelNbr,
                               BYTE      b_UserCallingMode,
                               VOID *    pv_UserSharedMemory))
```

Parameters:**- Input:**

BYTE	b_BoardHandle	Handle of board PA 1000
BYTE	b_UserCallingMode	PA1000_SYNCHRONOUS_MODE: The user routine is directly called by the driver interrupt routine. PA1000_ASYNCHRONOUS_MODE: The user routine is called by the driver interrupt thread.
VOID	v_FunctionName	Name of the user interrupt routine
ULONG	ul_UserSharedMemorySize	Determines the size in bytes of the user shared memory. Only used if you have selected PA1000_SYNCHRONOUS_MODE

i**IMPORTANT!**

The size of the User Shared Memory is limited to 63 MB. It could cause problems if more memory is required.

- Output:

VOID **	ppv_UserSharedMemory	User shared memory address Only used if you have selected PA1000_SYNCHRONOUS_MODE
---------	----------------------	--

Task:

If you use Visual Basic 5.0 :

- only the asynchronous mode is available.

i**Windows 32-bit information**

For Windows NT and Windows 95, 4 rings (ring 0 to ring 3) are available.

- The user application operates in ring 3. This ring does not give access to hardware.
- VXD and SYS driver operate in ring 0 and give access to hardware.

- Ring 0 has no direct access to global variable from ring 3. It has to use a shared memory.
- Ring 0 and ring 3 have a pointer that points on this shared memory. The 2 pointers are not configured under the same address.

This function must be called up for each **PA 1000** for which an interrupt is to be enabled. It installs one user interrupt function in all boards on which an interrupt is to be enabled.

First calling (first board):

- the user interrupt routine is installed
- interrupts are enabled
- user shared memory is allocated if PA1000_SYNCHROUNOUS_MODE has been selected.

If you operate several boards **PA 1000** which have to react to interrupts, call up the function as often as you operate boards **PA 1000**. The variable *v_FunctionName* is only relevant **for the first calling**.

From the second call of the function (next board):

- interrupts are enabled.

Interrupt

The user interrupt routine is called up by the system when an interrupt is generated.

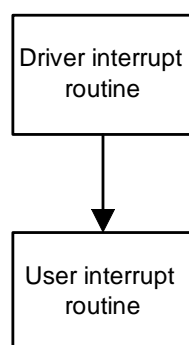
If several boards are operated and if they have to react to interrupts, the variable *b_BoardHandle* returns the identification number (handle) of the board which has generated the interrupt.

User interrupt routine can be called:

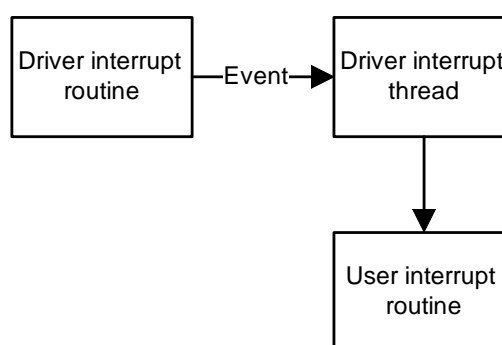
- directly by driver interrupt routine (Synchronous mode). The code of the user interrupt routine directly operates in ring 0.
- by the driver interrupt thread (Asynchronous mode). An event is generated and the interrupt thread calls up the user interrupt routine. The code of the user interrupt routine operates in ring 3.

The driver interrupt thread has the highest priority (31) in the system.

Synchronous mode



Asynchronous mode



SYNCHRONOUS MODE	
ADVANTAGE	The code of the user interrupt routine is directly called by the driver interrupt routine (ring 0). The time between the interrupt and the user interrupt routine is reduced.
RESTRICTIONS	The user cannot debug the user interrupt routine.
	The user routine cannot call Windows API functions.
	The user routine cannot call functions which have access to global variables. The user can still use a shared memory.
	This mode is not available for Visual Basic.

ASYNCHRONOUS MODE	
ADVANTAGES	The user can debug the user interrupt routine provided he did not program in Visual Basic 5.
	The user routine can call Windows API functions.
	The user routine can call functions which give access to global variables.
RESTRICTION	The code of the user interrupt routine is called by the driver interrupt thread routine (ring 3). The time between the interrupt and the user interrupt routine is increased.

Shared memory

If you have selected the PA1000_SYNCHRONOUS_MODE you cannot have access to global variables. But you have the possibility to create a shared memory (*ppv_UserSharedMemory*). The user shared memory can have all predefined compiler types or user define types.

The variable *ul_UserSharedMemorySize* indicates the size in bytes of the selected user type. A pointer of the variable *ppv_UserSharedMemory* is given to the user interrupt routine with the variable *pv_UserSharedMemory*. This is not possible for Visual Basic.

The user interrupt routine must have the following syntax:

```
VOID  v_FunctionName (BYTEb_BoardHandle,
                    BYTE      b_InterruptMask,
                    BYTE      b_InputChannelNbr,
                    BYTE      b_UserCallingMode,
                    VOID *    pv_UserSharedMemory)
```

v_FunctionName

b_BoardHandle

b_InterruptMask

b_InputChannelNbr

b_UserCallingMode

pv_UserSharedMemory

Name of the user interrupt routine

Handle of the **PA 1000** which has generated the interrupt

Mask of the events which have generated the interrupt.

Is not used. But stays for compatibility reasons.

PA1000_SYNCHRONOUS_MODE:

The user routine is directly called by driver interrupt routine.

PA1000_ASYNCHRONOUS_MODE:

The user routine is called by driver interrupt thread

Pointer of the user shared memory.

i**IMPORTANT!**

If you use Visual Basic 4 the following parameters have no meaning. You must use the „i_PA1000_TestInterrupt“ function.

```

BYTE    b_UserCallingMode,
ULONG   ul_UserSharedMemorySize,
VOID ** ppv_UserSharedMemory,
VOID    v_FunctionName    (BYTE b_BoardHandle,
                           BYTE    b_InterruptMask,
                           BYTE    b_InputChannelNbr,
                           BYTE    b_UserCallingMode,
                           VOID *   pv_UserSharedMemory)

```

The user can give another name for *v_FunctionName*, *b_BoardHandle*, *b_InterruptMask*, *b_InputChannelNbr*, *b_UserCallingMode*, *pv_UserSharedMemory*.

Calling convention:ANSI C :

```

typedef struct
{
    .
    .
    .
}str_UserStruct;

str_UserStruct * ps_UserSharedMemory;

void    v_FunctionName    (unsigned char b_BoardHandle,
                           unsigned char b_InterruptMask,
                           unsigned char b_InputChannelNbr,
                           unsigned char b_UserCallingMode,
                           void *       pv_UserSharedMemory)
{
    str_UserStruct * ps_InterruptSharedMemory;

    ps_InterruptSharedMemory = (str_UserStruct *)
pv_UserSharedMemory;
    .
    .
}

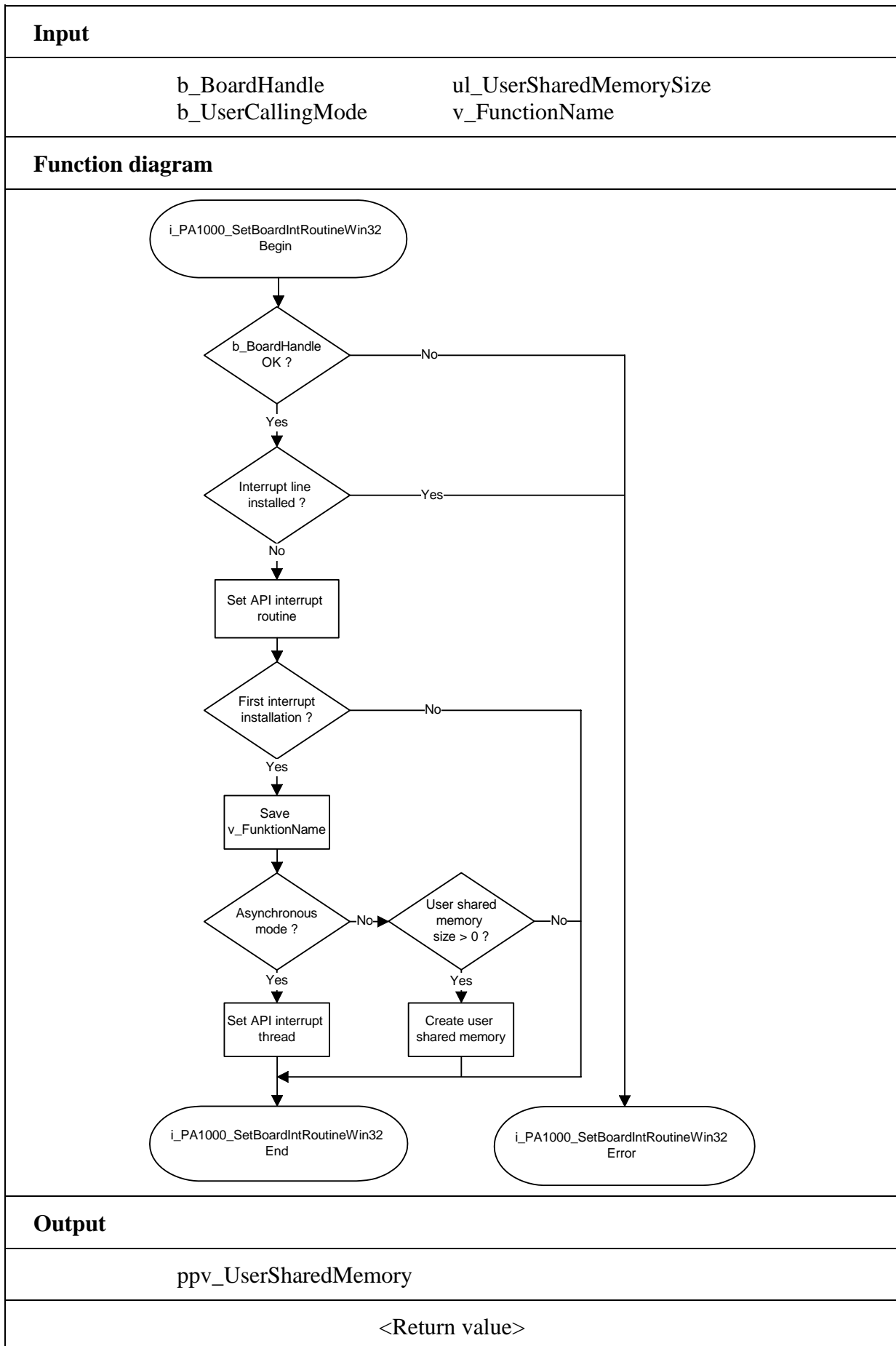
int          i_ReturnValue;
unsigned char b_BoardHandle;

```

```
i_ReturnValue = i_PA1000_SetBoardIntRoutineWin32  
                (b_BoardHandle, PA1000_SYNCHRONOUS_MODE,  
                sizeof (str_UserStruct),  
                (void **) &ps_UserSharedMemory,  
                v_FunctionName);
```

Return value:

- 0: No error
- 1: The handle parameter of the board is wrong
- 2: Interrupt already installed
- 3: Parameter b_UserCallingMode is wrong.



5) i_PA1000_TestInterrupt (..)

Syntax:

<Return value> = i_PA1000_TestInterrupt (PBYTE pb_BoardHandle,
PBYTE pb_InterruptMask,
PBYTE pb_ChannelNbr)

Parameters:

- Input:

No input signal has occurred.

- Output:

PBYTE pb_BoardHandle Handle of the board **PA 1000** which has generated the interrupt,
PBYTE pb_InterruptMask Error mask of the event which has generated the interrupt. Several errors can simultaneously occur.

Mask	Meaning
0000 0001	Event 1 has occurred
0000 0010	Event 2 has occurred
0000 0100	Counter/timer 1 has run down
0000 1000	Counter/timer 2 has run down
0001 0000	Counter/Timer3 has run down

PBYTE pb_ChannelNbr Is not used. But stays for compatibility reasons

Task:

Checks if a board **PA 1000** has generated an interrupt. If yes, the function returns the board handle and the interrupt source.



IMPORTANT!

This function is only in Visual Basic Dos and Windows available.

Calling convention:

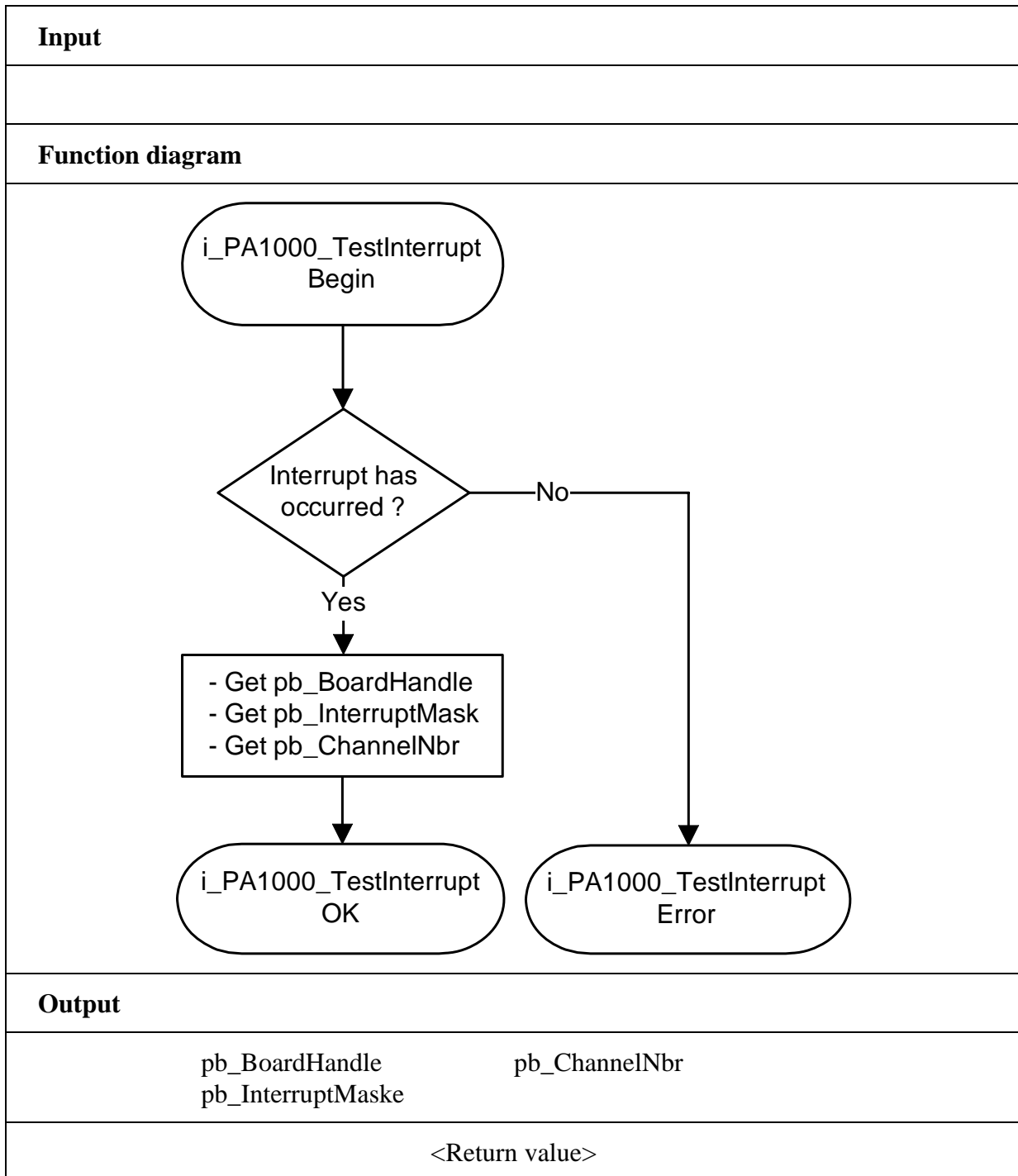
ANSI C :

```
unsigned char b_BoardHandle;
unsigned char b_InterruptMask;
unsigned char b_ChannelNbr;
int i_Irq;
```

```
i_Irq = i_PA1000_TestInterrupt (&b_BoardHandle,
                                &b_InterruptMask,
                                &b_ChannelNbr);
```

Return value:

-1: No interrupt
> 0: IRQ number



6) i_PA1000_ResetBoardIntRoutine (..)**Syntax:**

<Return value> = i_PA1000_ResetBoardIntRoutine
(BYTE b_BoardHandle)

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Stops the interrupt management of board **PA1000**.

Deinstalls the interrupt routine if the interrupt management of all **PA 1000** is stopped.

Calling convention:ANSI C:

unsigned char b_BoardHandle;

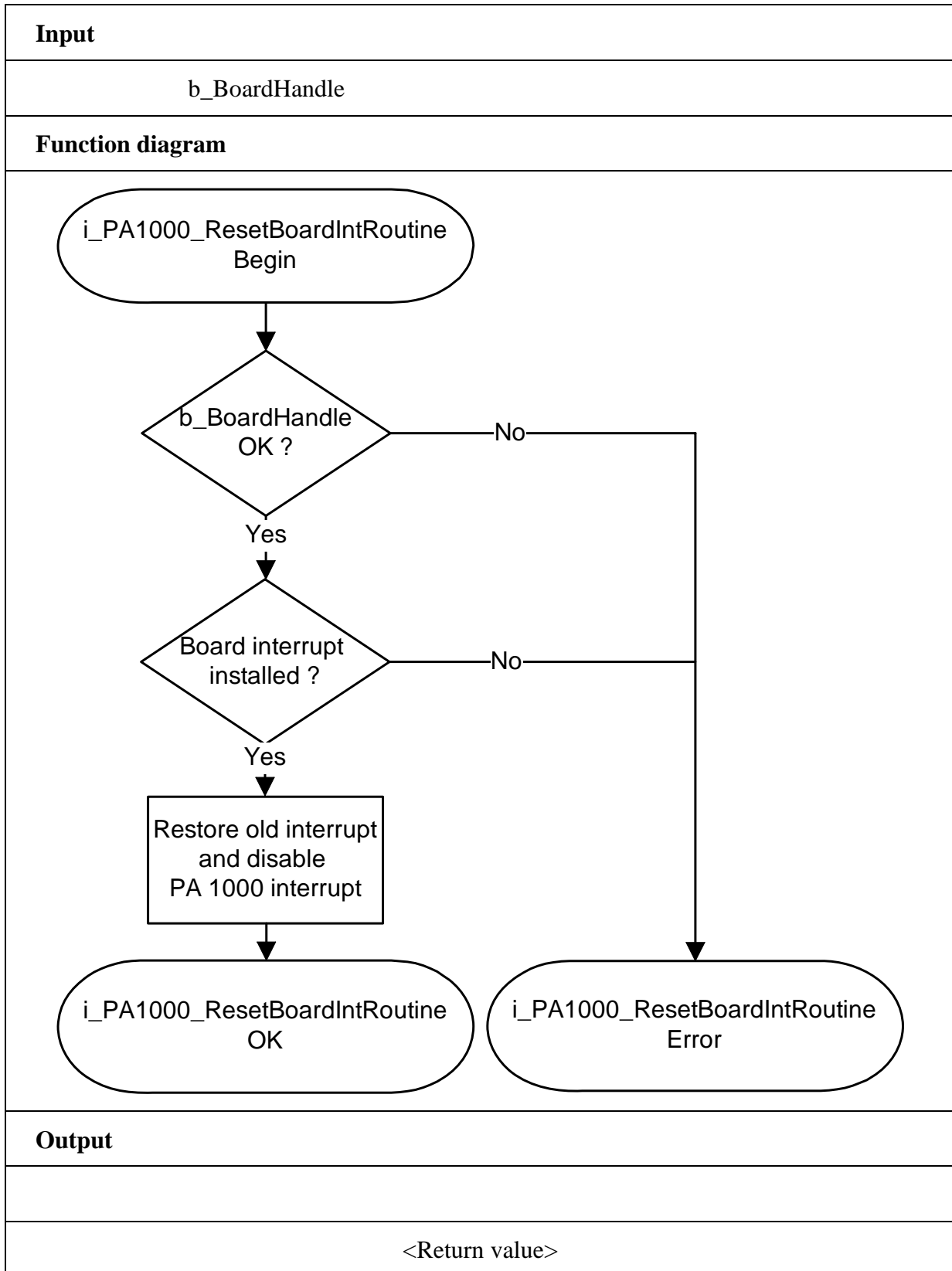
i_PA1000_ResetBoardIntRoutine (b_BoardHandle);

Return value:

0: No error

-1: Handle parameter of the board is wrong

-2: Interrupt routine is not installed



3.3 Digital input channels

1) `i_PA1000_Read1DigitalInput (...)`

Syntax :

```
<Return value> = i_PA1000_Read1DigitalInput (BYTE_ b_BoardHandle,
                                             BYTE_ b_Channel,
                                             PBYTE_ pb_ChannelValue)
```

Parameters:

- Input:

BYTE	b_BoardHandle	Handle of board PA 1000
BYTE	b_Channel	Number of the input channel to be read (1 to 32)

- Output:

PBYTE	pb_ChannelValue	State of the digital input channel 0 -> low 1 -> high
-------	-----------------	---

Task:

Indicates the state of an input. The variable *b_Channel* passes the input channel to be read (1 to 32). A value is returned with the variable *pb_ChannelValue* : 0 (low) or 1 (high).

Calling convention:

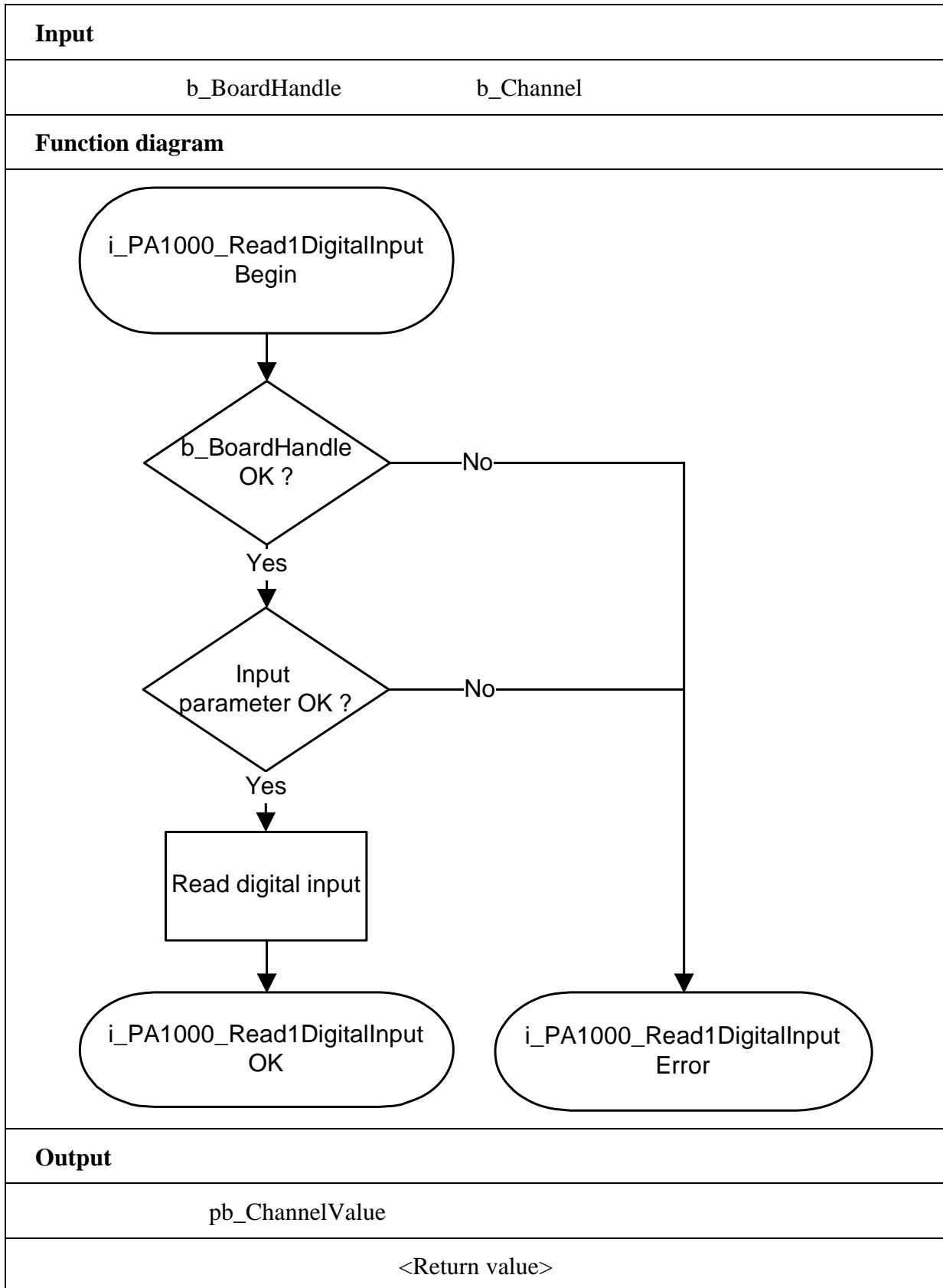
ANSI C :

```
int          i_ReturnValue;
unsigned char b_BoardHandle;
unsigned char b_ChannelValue;
```

```
i_ReturnValue = i_PA1000_Read1DigitalInput (b_BoardHandle,
                                             1,
                                             &b_ChannelValue);
```

Return value:

```
0: No error
-1: The handle parameter of the board is wrong
-2: The input number is not between 1 and 32
```



2) i_PA1000_Read8DigitalInput (...)

Syntax:

```
<Return value> = i_PA1000_Read8DigitalInput (BYTE b_BoardHandle,
                                             BYTE b_Port,
                                             PBYTE pb_PortValue)
```

Parameters:

- Input:

BYTE	b_BoardHandle	Handle of the PA 1000
BYTE	b_Port	Number of the input port to be read (1 or 4)

- Output:

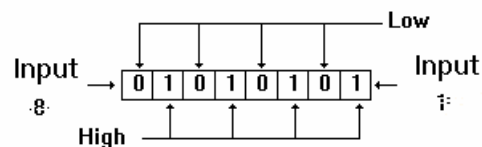
PBYTE	pb_PortValue	State of the digital input port (0 to 255)
-------	--------------	--

Task:

Indicates the state of an 8-bit port. The variable *b_Port* passes the port to be read (1 or 4). A value is returned with the variable *pb_PortValue*.

Example:

```
b_Port = 1
pb_PortValue = 55 Hex
```



A voltage is present on the input channels 1, 3, 5, 7
 A voltage is not present on the input channels 2, 4, 6, 8.

Calling convention:

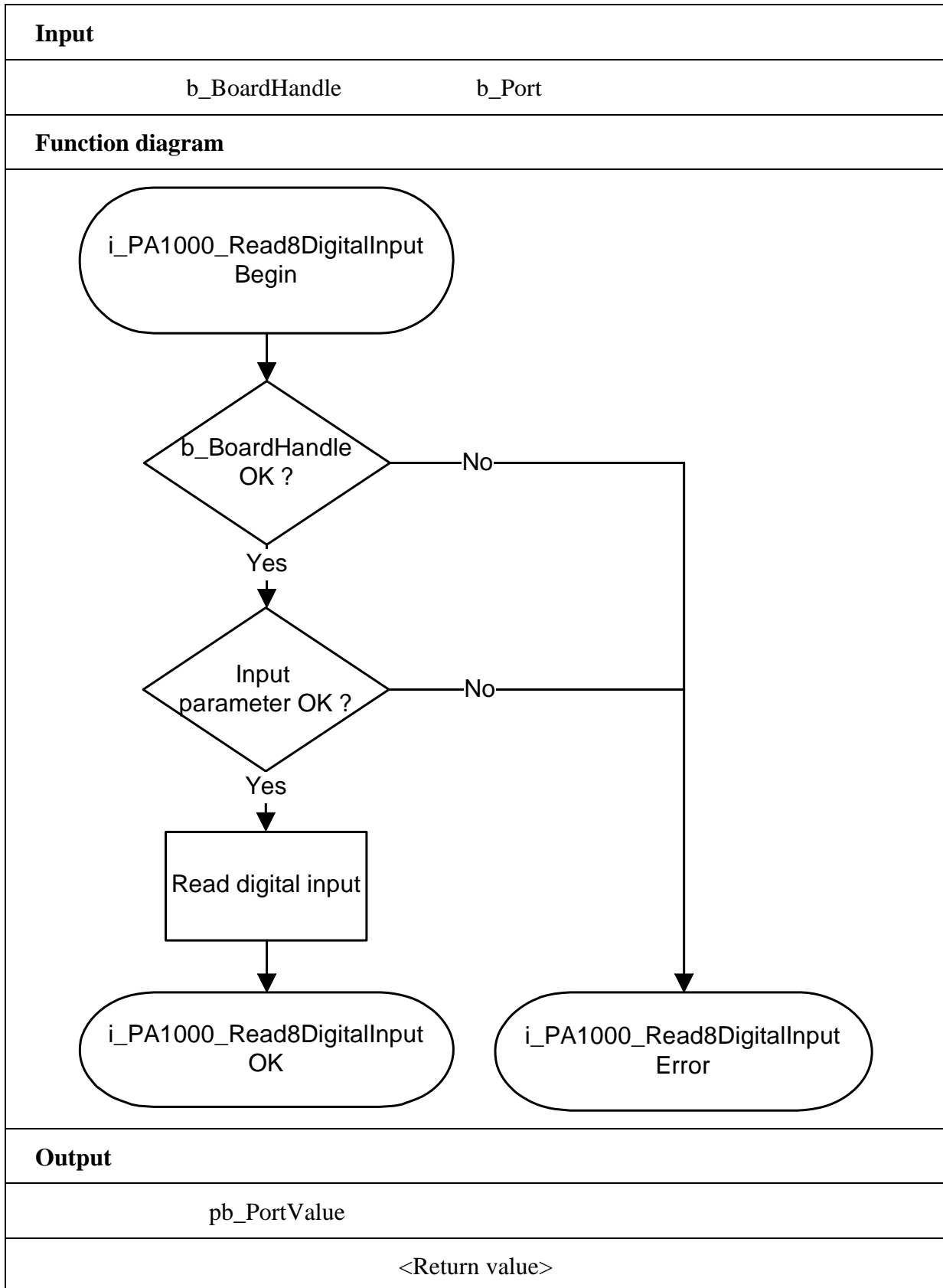
ANSI C:

```
int          i_ReturnValue;
unsigned char b_BoardHandle;
unsigned char b_PortValue;
```

```
i_ReturnValue = i_PA1000_Read8DigitalInput (b_BoardHandle,
                                             1,
                                             &b_PortValue);
```

Return value:

0: No error
 -1: Handle parameter of the board is wrong
 -2: The parametered port number is wrong (parameter 1 or 4)



3) i_PA1000_Read16DigitalInput (...)

Syntax:

```
<Return value> = i_PA1000_Read16DigitalInput (BYTE b_BoardHandle,
                                               BYTE b_Port
                                               PLONG pl_InputValue)
```

Parameters:

- Input:

BYTE	b_BoardHandle	Handle of the PA 1000
BYTE	b_Port	Number of the 16-bit input port to be read (1 or 2)

- Output:

PLONG	pl_InputValue	State of the digital input channels of both ports (0 to 65535)
-------	---------------	--

Task:

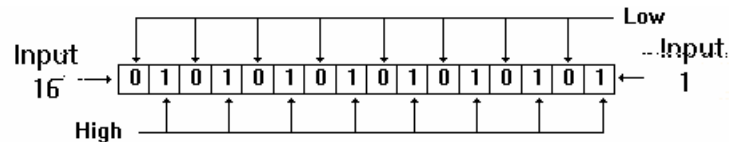
Indicates the state of a 16-bit port. The variable `b_Port` passes the port to be read (1 or 2). A value is returned with the variable `pl_InputValue`

Example:

Parameter

`b_Port = 1`

`pl_InputValue = 5555 Hex`



A voltage is present on the input channels 1, 3, 5, 7, 9, 11, 13, 15 .

A voltage is not present on the input channels 2, 4, 6, 8, 10, 12, 14, 16.

Calling convention:

ANSI C :

```
int          i_ReturnValue;
unsigned char b_BoardHandle;
unsigned long ul_PortValue;
```

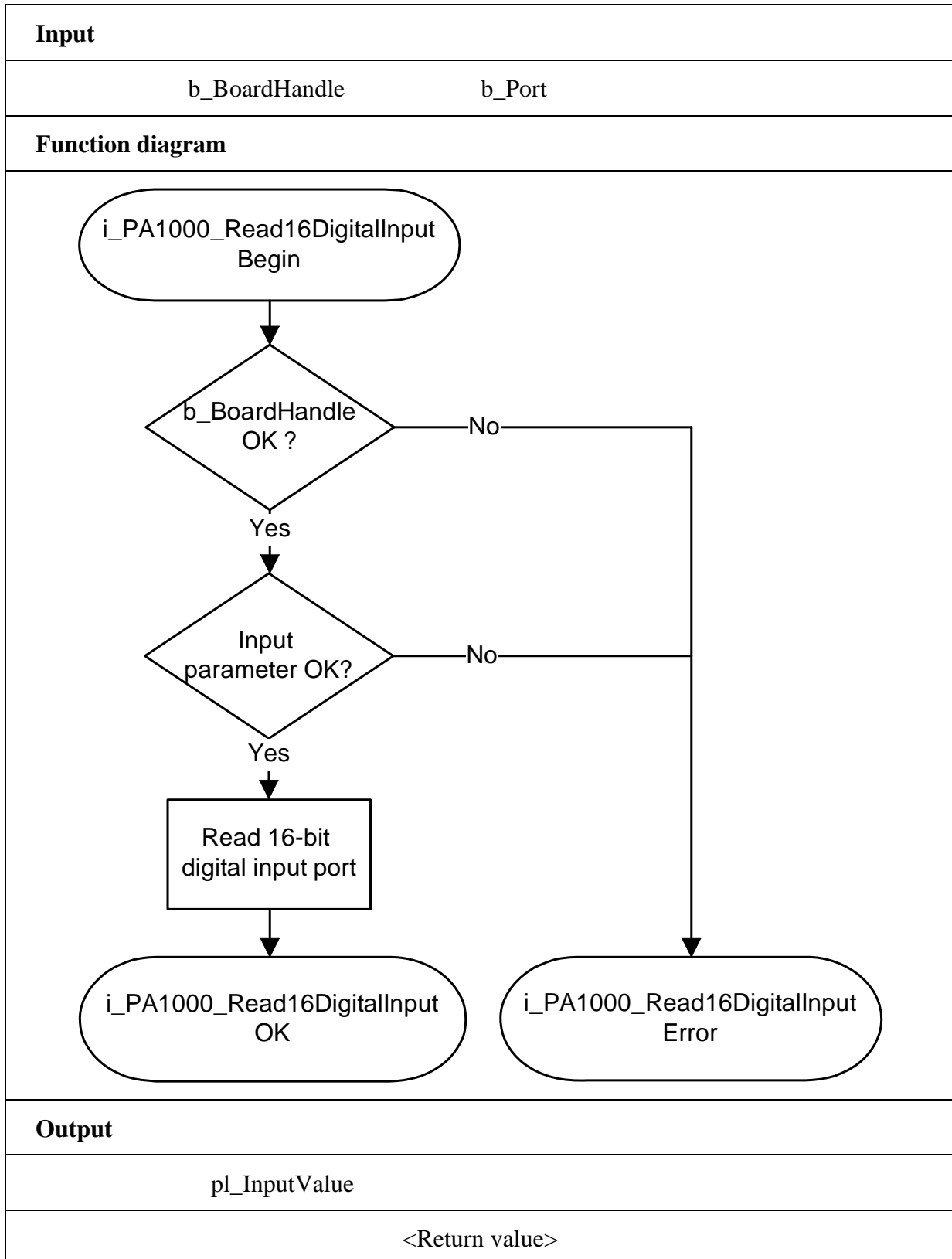
```
i_ReturnValue = i_PA1000_Read16DigitalInput
                (b_BoardHandle,
                 1,
                 & ul_PortValue);
```

Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The parametered port number is wrong (Parameter 1 or 2)



4) i_PA1000_Read32DigitalInput (...)

Syntax:

<Return value> = i_PA1000_Read32DigitalInput (BYTE b_BoardHandle, PLONG pl_InputValue)

Parameters:

- Input:

BYTE b_BoardHandle Handle of board PA 1000

- Output:

PLONG pl_InputValue State of the digital input channels of both ports (0 to 2³²)

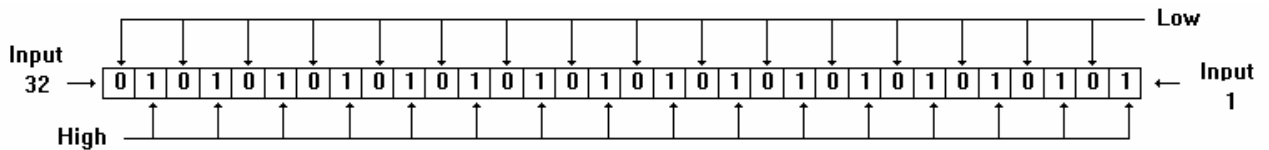
Task:

Indicates the state of the 32 inputs channels.

Example:

Parameter

pl_InputValue = 55555555 Hex



A voltage is present on the input channels 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29 and 31.

A voltage is not present on the input channels 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30 and 32.

Calling convention:

ANSI C :

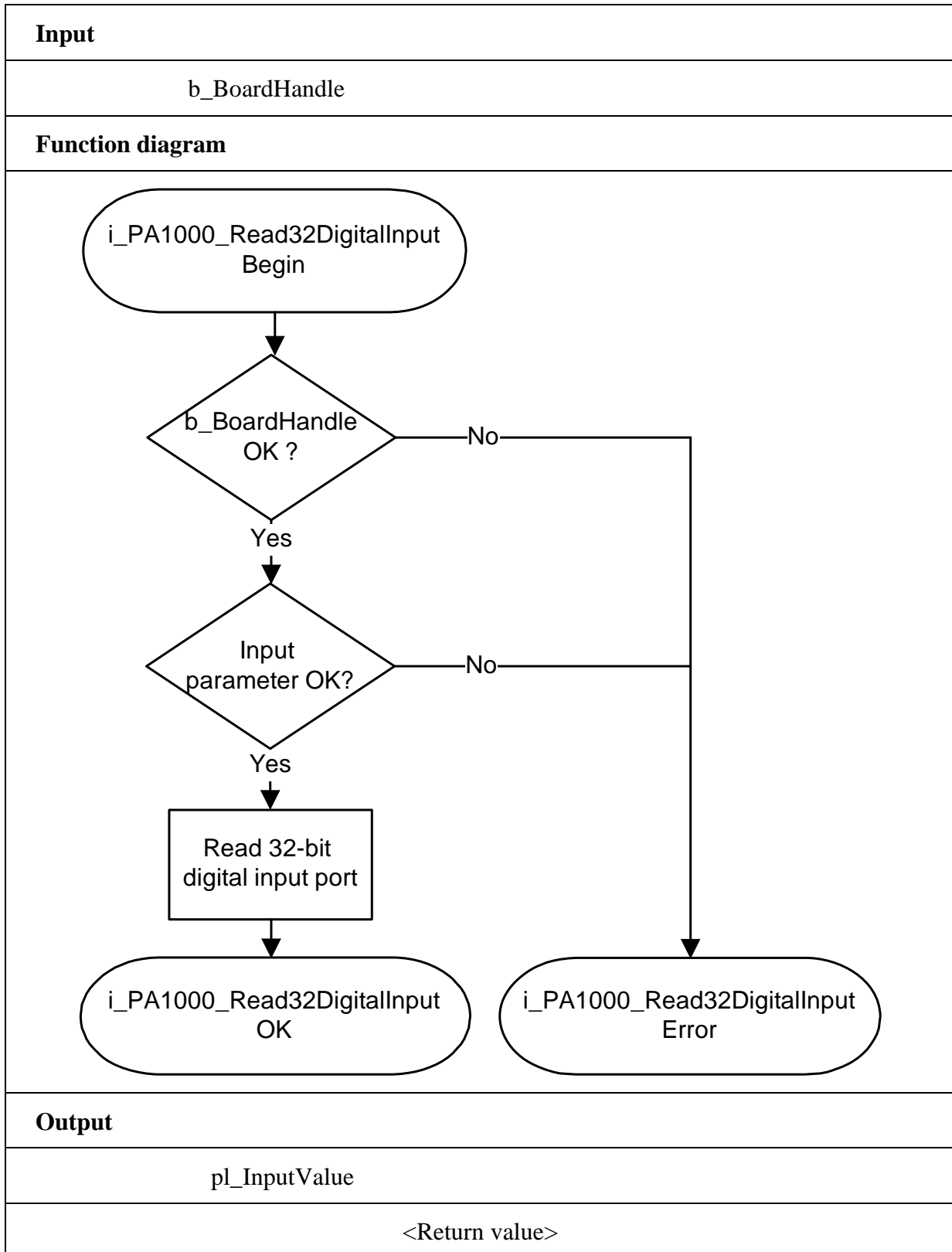
```
int          i_ReturnValue;
unsigned char b_BoardHandle;
unsigned long ul_PortValue;
```

```
i_ReturnValue = i_PA1000_Read32DigitalInput (b_BoardHandle,
                                             &ul_PortValue);
```

Return value:

0: No error

-1: Handle parameter of the board is wrong



3.4 Digital input channel - events



1) i_PA1000_SetInputEventMask (...)

Syntax:

```
<Return value> = i_PA1000_SetInputEventMask
                    (BYTE    b_BoardHandle,
                     BYTE    b_PortNbr,
                     BYTE    b_Logik,
                     PCHAR   pc_EventMask)
```

Parameters:

- Input:

<p>BYTE b_BoardHandle</p> <p>BYTE b_PortNbr</p> <p>BYTE b_Logik</p> <p>PCHAR pc_EventMask</p>	<p>Handle of board PA 1000</p> <p>Number of the input port you wish to mask (1 or 2).</p> <p>Event logic</p> <p>Three possibilities for the two ports:</p> <p>PA1000_AND: This logic connects the inputs with an AND logic.</p> <p>PA1000_OR: This logic connects the inputs with an OR logic.</p> <p>This 8-digit character string defines the event mask of 8 inputs.</p> <p>Each digit indicates the input state. The state is identified by one of the following characters:</p> <p>"X": The input channel is not used for event</p> <p>"0": The input channel must be on "0"</p> <p>"1": The input channel must be on "1"</p> <p>"2": The input channel reacts to a falling edge </p> <p>"3": The input channel reacts to a rising edge </p> <p>"4": The input channel reacts to both edges</p> <p><u>Port 1</u>: from the left to the right, the first digit of the character string is input 8 and the last digit is input 1.</p> <p><u>Port 2</u>: from the left to the right, the first digit of the character string is input 16 and the last digit is input 9.</p>
--	--

- Output:

No output signal has occurred



IMPORTANT!

If you use the PA1000_AND logic, you can use only one edge event.

Task:

An event can be generated for each port.

The first event is related to the first 8 inputs (port 1). The second event is related to the next 6 inputs (port 2).

An interrupt is generated when one or both events have happened.

An event is a change of state (eg.: low → high, high → low) on one or several input channels if an AND/OR/OR_PRIORITY logic has been defined.

Examples:

Example 1:

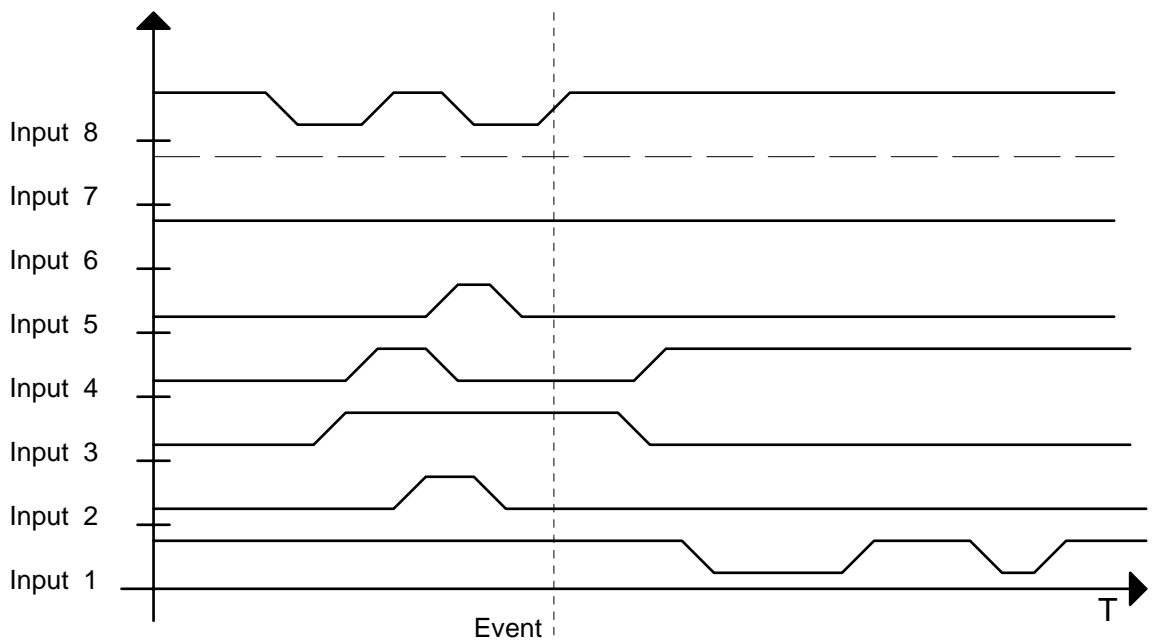
Parameter

```

b_PortNbr    = 1
  b_Logik     = PA1000_AND
  pc_EventMask = "3X100101"
    
```

An event is generated:

- when the inputs 2, 4 and 5 are on "0".
- when the inputs 1, 3 and 6 are on "1"
- and when a rising edge has been detected at input 8.



Calling convention:

ANSI C:

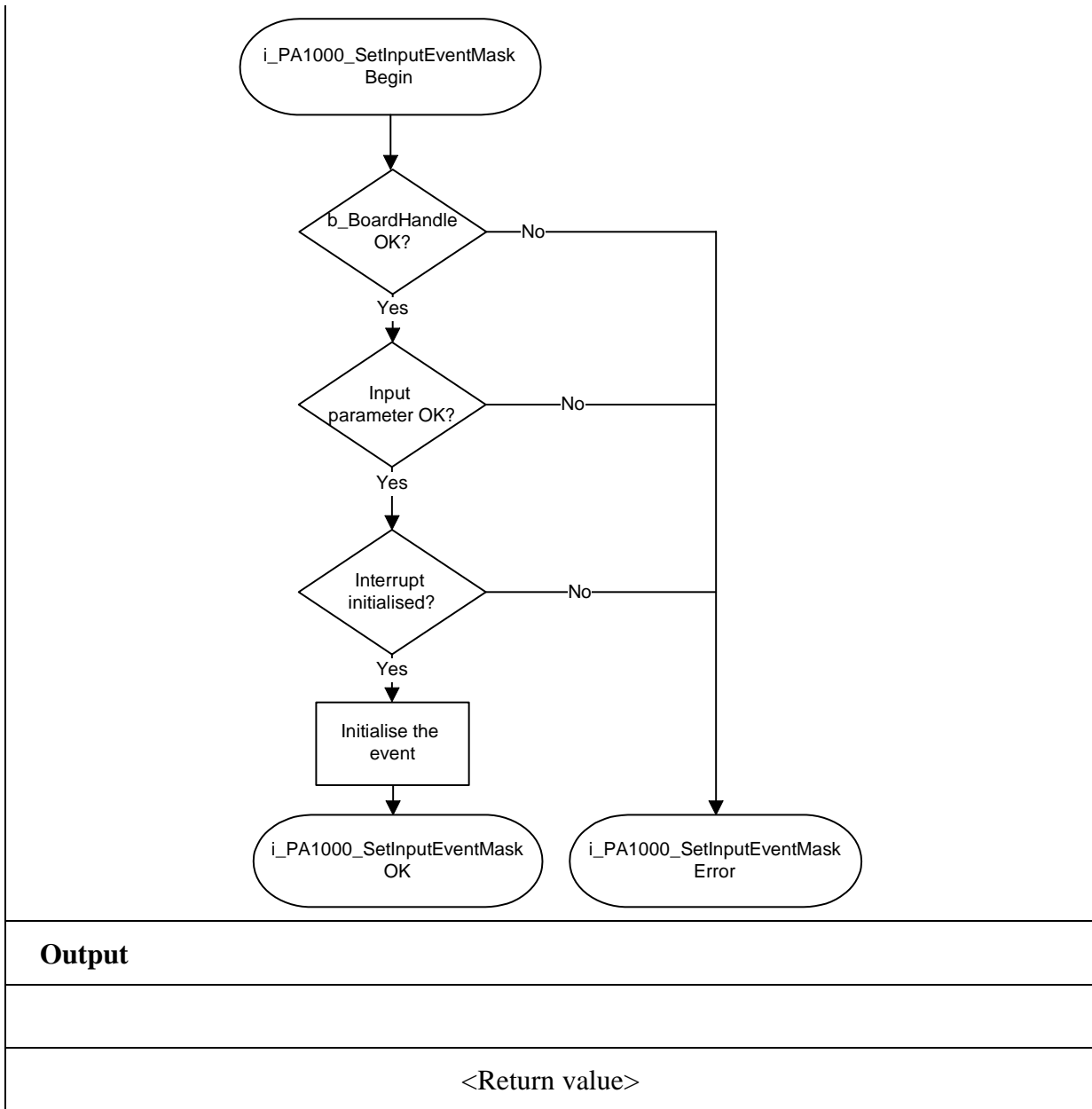
```
int          i_ReturnValue;
unsigned char b_BoardHandle;

i_ReturnValue = i_PA1000_SetInputEventMask (b_BoardHandle,
                                             1,
                                             PA1000_OR,
                                             "11111111");
```

Return value:

- 0: No error
- 1: The handle parameter of the board is wrong
- 2: The parametered port number is wrong (parameter 1 or 2)
- 3: Error with the logic parameter. *b_Logik* has not the expected value
- 4: Error with the event mask parameter. *pc_EventMask* has not the expected value
- 5: Interrupt routine not installed
- 6: More than 1 edge event has been declared for an AND logic
- 7: The OR PRIORITY logic does not support any edge event

Input	
b_BoardHandle	b_Logik
b_PortNbr	pc_EventMask
Function diagram	



Output

<Return value>

2) i_PA1000_StartInputEvent (...)**Syntax :**

<Return value> = i_PA1000_StartInputEvent (BYTE_b_BoardHandle,
BYTE_b_PortNbr)

Parameters:**- Input:**

BYTE	b_BoardHandle	Handle of board PA 1000
BYTE	b_PortNbr	Number of the input port (1 or 2)

- Output:

No output signal has occurred

Task:

When the function is called, it is possible to process an event on one port.
Previously mask the input channels with the following function:

“i_PA1000_SetInputEventMask “.

Calling convention:ANSI C :

```
int          i_ReturnValue;  
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_StartInputEvent (b_BoardHandle, 1);
```

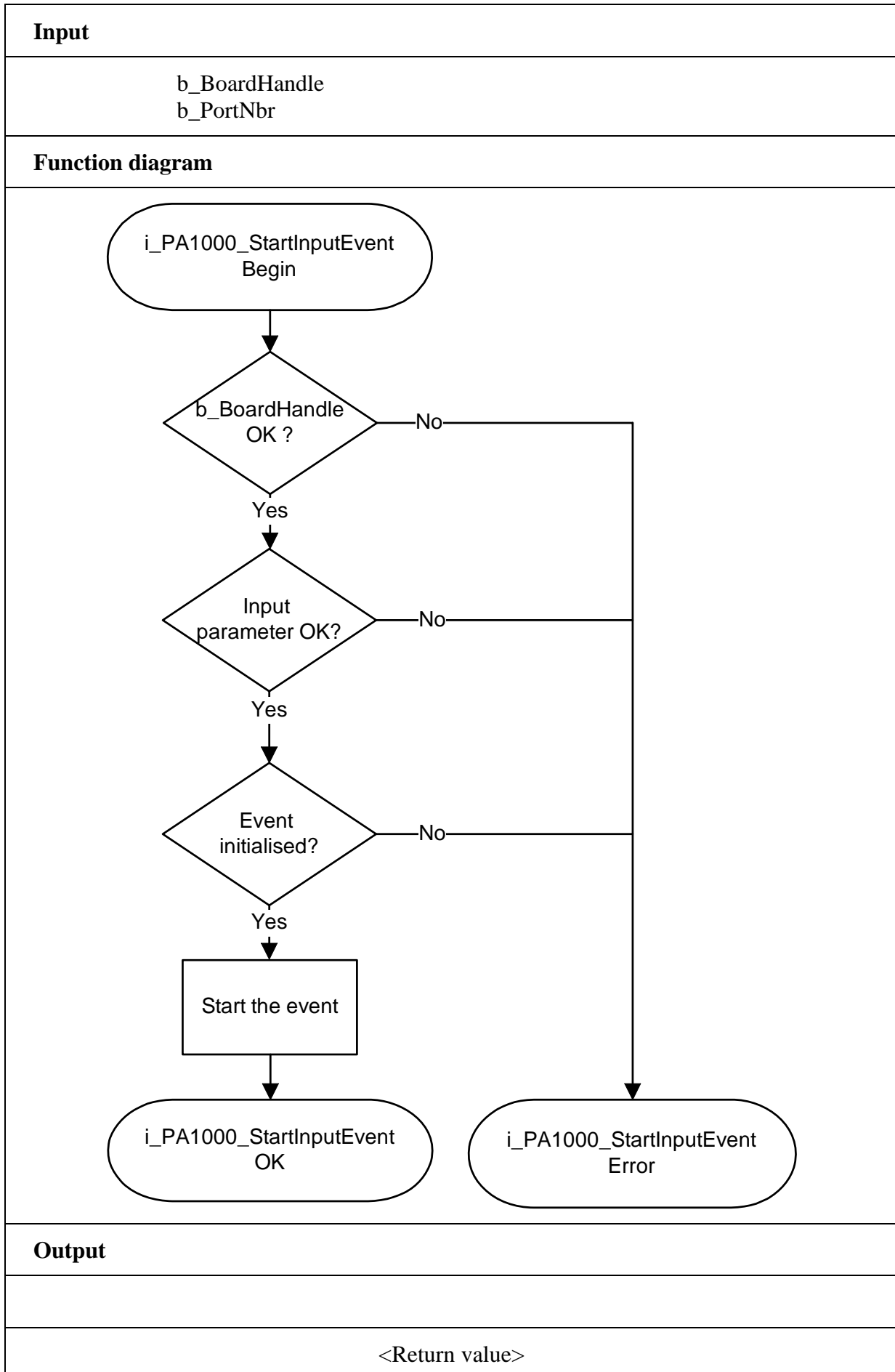
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The parametered port number is wrong

-3: Event has not been initialised with the function "i_PA1000_SetInputEvent"



3) i_PA1000_StopInputEvent (...)

Syntax:

<Return value> = i_PA1000_StopInputEvent (BYTE b_BoardHandle,
BYTE b_PortNbr)

Parameters:**- Input:**

BYTE	b_BoardHandle	Handle of board PA 1000
BYTE	b_PortNbr	Number of the input port (1 or 2)

- Output:

No output signal has occurred

Task:

When the function is called, it is not possible to process an event on one port.

Calling convention:ANSI C:

```
int          i_ReturnValue;  
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_StopInputEvent (b_BoardHandle, 1);
```

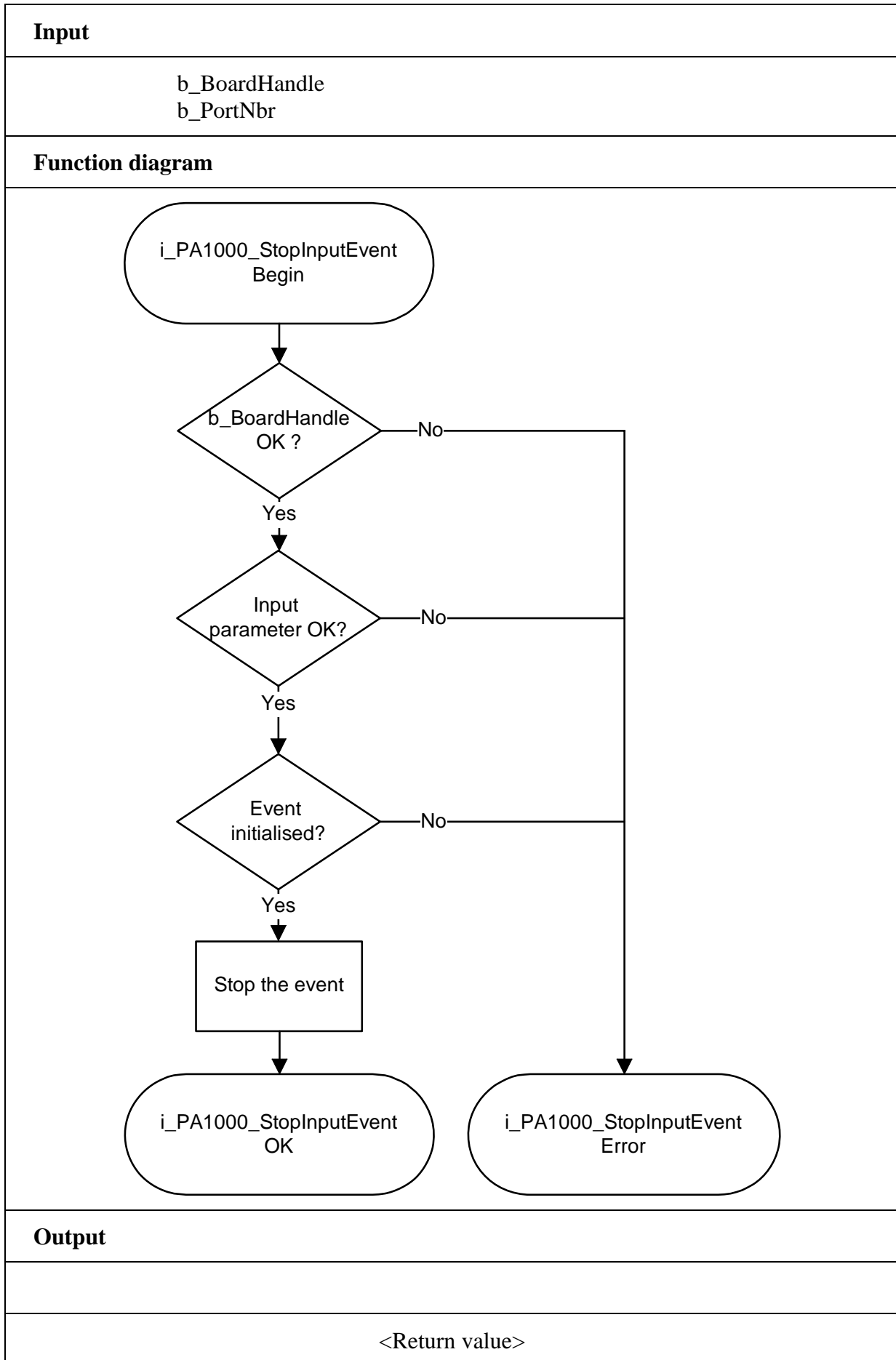
Return value:

0: No error

-1: Handle parameter of the board is wrong

-2: The parametered port number is wrong

-3: Event has not been initialised with the function "i_PA1000_SetInputEvent"



3.5 Timer/counter

1) i_PA1000_InitTimerCounter1 (...)

Syntax:

```
<Return value> = i_PA1000_InitTimerCounter1
                    (BYTE b_BoardHandle,
                     BYTE   b_CounterOrTimerSelect,
                     LONG   l_ReloadValue,
                     BYTE   b_ContinuousOrSingleCycleSelect,
                     BYTE   b_HardwareOrSoftwareTriggerSelect,
                     BYTE   b_HardwareOrSoftwareGateSelect,
                     BYTE   b_InterruptHandling)
```

Parameters:

- Input:

BYTE	b_BoardHandle:	Handle of board PA 1000
BYTE	b_CounterOrTimerSelect	Selecting the mode of the first counter/timer - PA1000_TIMER : The first counter/timer is used as a timer - PA1000_COUNTER : The first counter/timer is used as a counter
LONG	l_ReloadValue	This parameter has two meanings. If the counter/timer is used as a counter, it loads the start value of the counter. If the counter/timer is used as a timer, it loads the divider factor for the output.
BYTE	b_ContinuousOrSingleCycleSelect	- PA1000_CONTINUOUS: Each time the counting value or timer value is set to "0", <i>l_ReloadValue</i> is loaded. - PA1000_SINGLE: If the counting value or timer value is set to "0", the counter or timer is stopped
BYTE	b_HardwareOrSoftwareTriggerSelect	- PA1000_HARDWARE_TRIGGER: Input 15 is used for the trigger. If the input is on high, the start value is re-loaded - PA1000_SOFTWARE_TRIGGER: Input 15 has no influence on trigger

- BYTE b_HardwareOrSoftwareGateSelect
- PA1000_HARDWARE_GATE:
Input 16 is used for the gate.
If the input is on high, the counter/timer is started.
If the input is on low, the counter/timer is stopped
 - PA1000_SOFTWARE_GATE:
Input 16 has no influence on gate.
- BYTE b_InterruptHandling
- Interrupts can be generated, when the counter has run down, or when the timer output is on high.
With this parameter the user decides if interrupts are used or not
- PA1000_ENABLE: interrupts are enabled.
 - PA1000_DISABLE: interrupts are disabled.

- Output:

No output signal has occurred

Task:

Selecting the operating mode of the first counter/timer. Enter the start value of the counter/timer.

You have to decide:

- if the counter/timer must execute once or several times the counting operation.
- if the counter/timer is used as a counter or a timer
- and if an interrupt must be generated when the counter/timer has run down.

Calling convention:

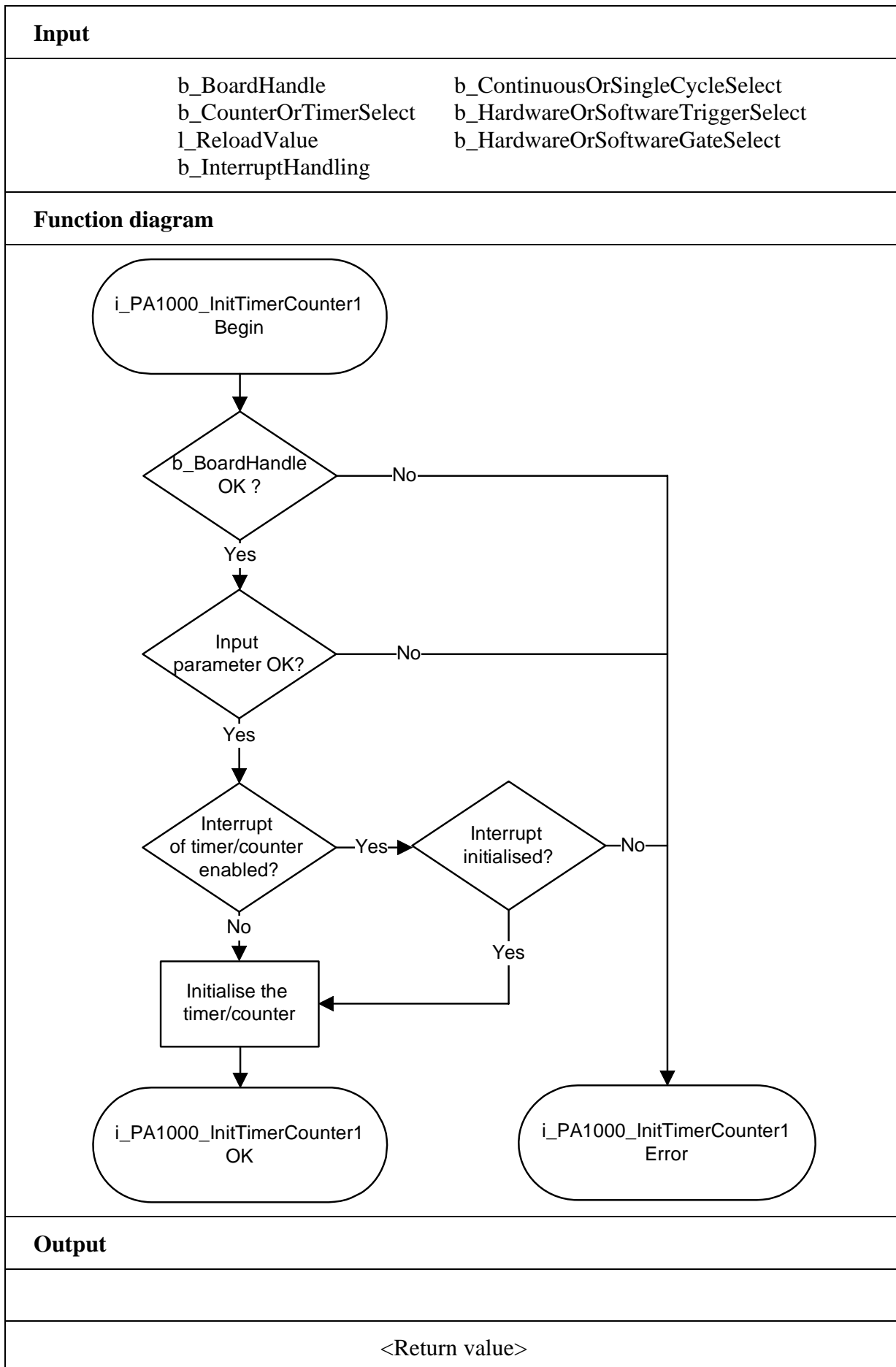
ANSI C :

```
int          i_ReturnValue;
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_InitTimerCounter1
                (b_BoardHandle,
                 PA1000_TIMER,
                 1000,
                 PA1000_CONTINUOUS,
                 PA1000_SOFTWARE_TRIGGER,
                 PA1000_SOFTWARE_GATE,
                 PA1000_DISABLE);
```

Return value:

- 0: No error
- 1: The handle-parameter of the board is wrong
- 2: The parameter for selecting the counter or the timer is wrong
(PA1000_COUNTER or PA1000_TIMER)
- 3: Error with the interrupt selection
(PA1000_ENABLE or PA1000_DISABLE)
- 4: User interrupt routine is not installed
- 5: Cycle parameter is wrong
(PA1000_CONTINUOUS or PA1000_SINGLE)
- 6: Gate parameter is wrong
(PA1000_SOFTWARE_GATE or PA1000_HARDWARE_GATE)
- 7: Trigger parameter is wrong
(PA1000_SOFTWARE_TRIGGER or PA1000_HARDWARE_TRIGGER)



2) i_PA1000_InitTimerCounter2 (...)**Syntax:**

```
<Return value> = i_PA1000_InitTimerCounter2
                    (BYTE b_BoardHandle,
                     BYTE   b_CounterOrTimerSelect,
                     LONG   l_ReloadValue,
                     BYTE   b_ContinuousOrSingleCycleSelect,
                     BYTE   b_HardwareOrSoftwareTriggerSelect,
                     BYTE   b_HardwareOrSoftwareGateSelect,
                     BYTE   b_InterruptHandling)
```

Parameters:**- Input:**

BYTE	b_BoardHandle	Handle of board PA 1000
BYTE	b_CounterOrTimerSelect	Selecting the mode of the second counter/timer - PA1000_TIMER: The second counter/timer is used as a timer - PA1000_COUNTER : The second counter/timer is used as a counter
LONG	l_ReloadValue	This parameter has two meanings. If the counter/timer is used as a counter, it loads the start value of the counter. If the counter/timer is used as a timer it loads the divider factor for the output.
BYTE	b_ContinuousOrSingleCycleSelect	- PA1000_CONTINUOUS: Each time the counting value or timer value is set to "0" <i>l_ReloadValue</i> is loaded. - PA1000_SINGLE: If the counting value or timer value is set to "0", the counter or timer is stopped.
BYTE	b_HardwareOrSoftwareTriggerSelect	- PA1000_HARDWARE_TRIGGER: The input 11 is used for the trigger. If the input is on high, the start value is re-loaded. - PA1000_SOFTWARE_TRIGGER: The input 11 has no influence on the trigger

- BYTE b_HardwareOrSoftwareGateSelect
- PA1000_HARDWARE_GATE:
The input 12 is used for the gate.
If the input is on high, the counter/timer is started.
If the input is on low, the counter/timer is stopped.
 - PA1000_SOFTWARE_GATE:
The input 12 has no influence on the gate.
- BYTE b_InterruptHandling
- Interrupts can be generated when the counter has run down, or when the timer output is on high ist.
With this parameter the user decides if interrupts are used or not.
- PA1000_ENABLE: interrupts are enabled.
 - PA1000_DISABLE: interrupts are disabled.

- Output:

No output signal has occurred

Task:

Selecting the operating mode of the second counter/timer. Enter the start value of the counter/timer.

You have to decide:

- if the counter /timer must execute once or several times the counting operation.
- if the counter/timer is used as a counter or a timer
- if an interrupt must be generated when the counter/timer has run down.
- if the external trigger is used
- and if the external gate is used.

Calling convention:

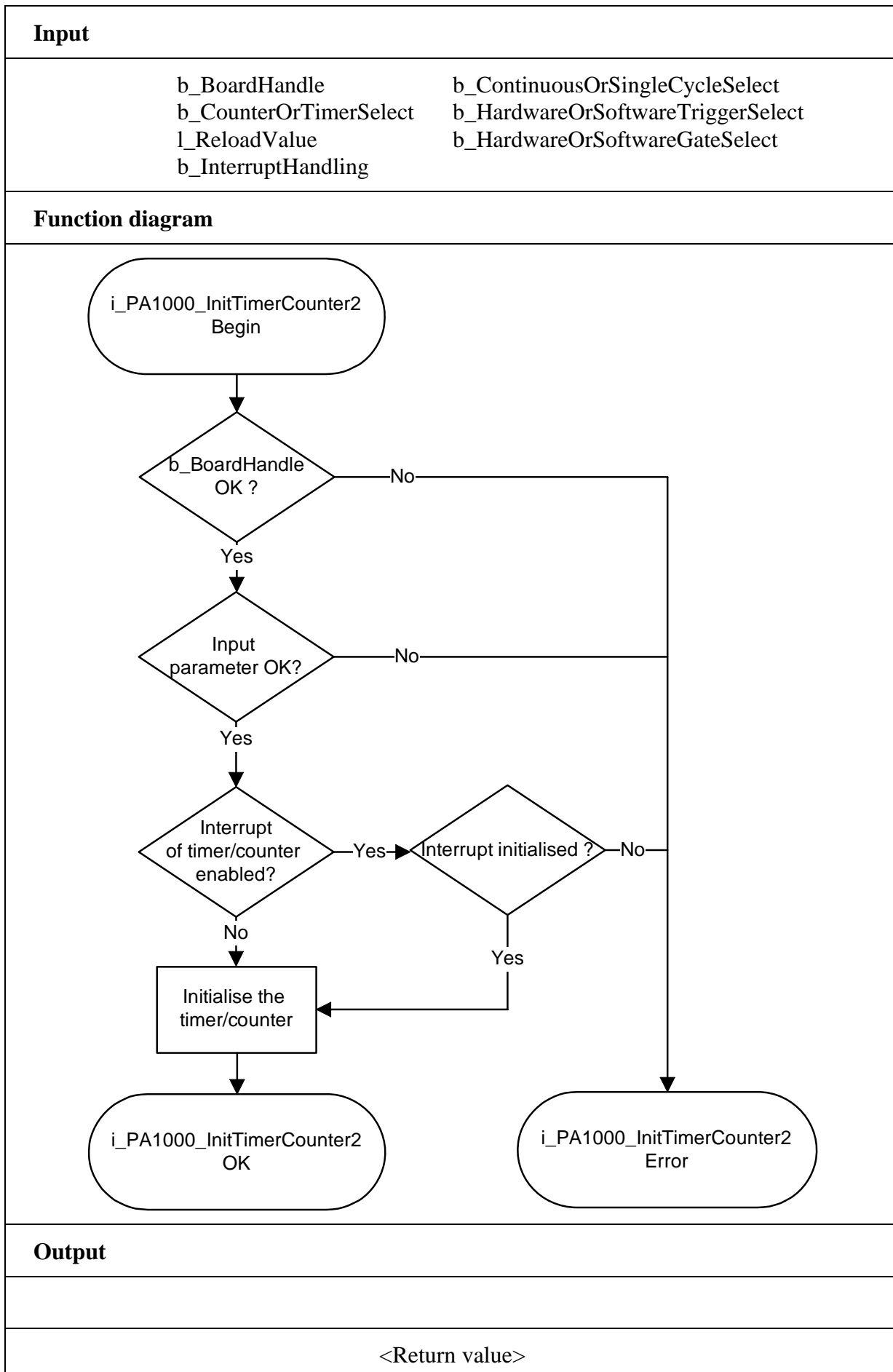
ANSI C:

```
int          i_ReturnValue;
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_InitTimerCounter2
                (b_BoardHandle,
                 PA1000_TIMER,
                 1000,
                 PA1000_CONTINUOUS,
                 PA1000_SOFTWARE_TRIGGER,
                 PA1000_SOFTWARE_GATE,
                 PA1000_DISABLE);
```

Return value:

- 0: No error
- 1: The handle parameter of the board is wrong
- 2: The parameter for selecting the counter or the timer is wrong
(PA1000_COUNTER oder PA1000_TIMER)
- 3: Error with the interrupt selection
(PA1000_ENABLE or PA1000_DISABLE)
- 4: User interrupt routine is not installed
- 5: Cycle parameter is wrong
(PA1000_CONTINUOUS or PA1000_SINGLE)
- 6: Gate parameter is wrong
(PA1000_SOFTWARE_GATE or PA1000_HARDWARE_GATE)
- 7: Trigger parameter is wrong
(PA1000_SOFTWARE_TRIGGER or PA1000_HARDWARE_TRIGGER)



3) i_PA1000_InitTimerCounter3 (...)**Syntax:**

```

<Return value> = i_PA1000_InitTimerCounter3
                    (BYTE b_BoardHandle,
                     BYTE   b_CounterOrTimerSelect,
                     LONG   l_ReloadValue,
                     BYTE   b_ContinuousOrSingleCycleSelect,
                     BYTE   b_HardwareOrSoftwareTriggerSelect,
                     BYTE   b_HardwareOrSoftwareGateSelect,
                     BYTE   b_InterruptHandling)

```

Parameters:**- Input:**

BYTE	b_BoardHandle	Handle of board PA 1000
BYTE	b_CounterOrTimerSelect	Selecting the mode of the third counter/timer - PA1000_TIMER : The third counter/timer is used as a timer - PA1000_COUNTER : The third counter/timer is used as a counter
LONG	l_ReloadValue	This parameter has two meanings. If the counter/timer is used as a counter, it loads the start value of the counter. If the counter/timer is used as a timer, it loads the divider factor for the output.
BYTE	b_ContinuousOrSingleCycleSelect	- PA1000_CONTINUOUS: Each time the counting value or timer value is set to "0", <i>l_ReloadValue</i> is loaded. - PA1000_SINGLE: If the counting value or timer value is set to "0", the counter or timer is stopped.
BYTE	b_HardwareOrSoftwareTriggerSelect	- PA1000_HARDWARE_TRIGGER: The input 19 is used for the trigger. If the input is on high, the start value re-loaded. - PA1000_SOFTWARE_TRIGGER: The input 19 has no influence on the trigger.

- BYTE b_HardwareOrSoftwareGateSelect
- PA1000_HARDWARE_GATE:
The input 20 is used for the gate.
If the input is on high, the counter/timer is started. If the input is on low, the counter/timer is stopped.
 - PA1000_SOFTWARE_GATE:
The input 20 has no influence on the gate.
- BYTE b_InterruptHandling
- Interrupts can be generated, when the counter has run down or when the output of the timer is on high.
With this parameter the user decides if interrupts are used or not.
- PA1000_ENABLE: interrupts enabled.
 - PA1000_DISABLE: interrupts disabled.

- Output:

No output signal has occurred

Task:

Selecting the operating mode of the third counter/timer. Enter the start value of the counter/timer.

You have to decide:

- if the counter/timer must execute once or several times the counting operation.
- if the counter/timer is used as a counter or a timer
- if an interrupt must be generated when the counter/timer has run down
- if the external trigger is used
- and if the external gate is used .

Calling convention:

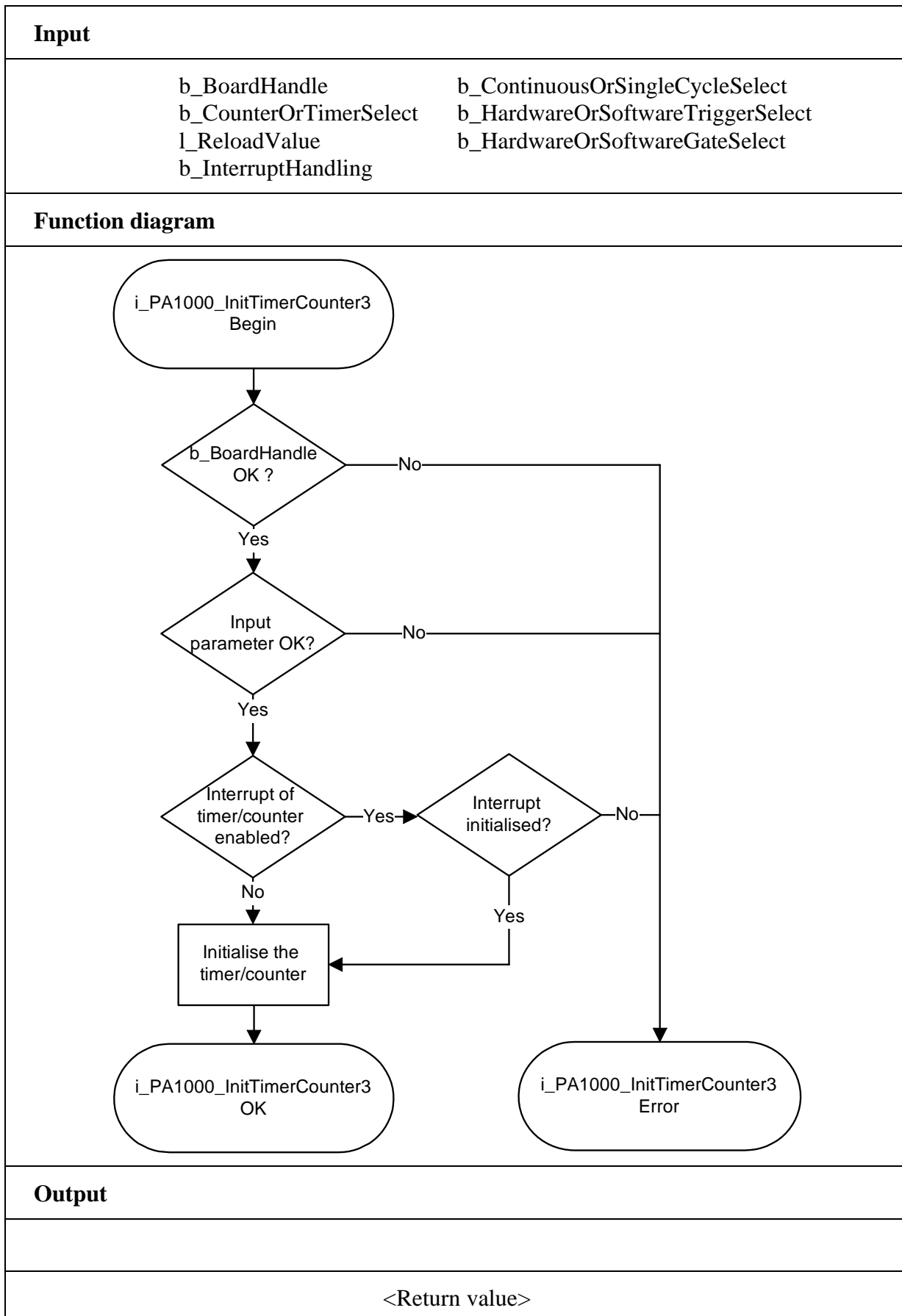
ANSI C:

```
int          i_ReturnValue;
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_InitTimerCounter3
                (b_BoardHandle,
                 PA1000_TIMER,
                 1000,
                 PA1000_CONTINUOUS,
                 PA1000_SOFTWARE_TRIGGER,
                 PA1000_SOFTWARE_GATE,
                 PA1000_DISABLE);
```

Return value:

- 0: No error
- 1: The handle parameter of the board is wrong
- 2: The parameter for selecting the counter or the timer is wrong
(PA1000_COUNTER or PA1000_TIMER)
- 3: Error with the interrupt selection
(PA1000_ENABLE or PA1000_DISABLE)
- 4: User interrupt routine is not installed
- 5: Cycle parameter is wrong
(PA1000_CONTINUOUS or PA1000_SINGLE)
- 6: Gate parameter is wrong
(PA1000_SOFTWARE_GATE or PA1000_HARDWARE_GATE)
- 7: Trigger parameter is wrong
(PA1000_SOFTWARE_TRIGGER or PA1000_HARDWARE_TRIGGER)



4) i_PA1000_StartTimerCounter1(...)

Syntax:

<Return value> = i_PA1000_StartTimerCounter1
(BYTE_ b_BoardHandle)

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Starts the first counter/timer. Please initialise it previously with the function "i_PA1000_InitTimerCounter1".

If the counter is used, it is now ready for counting.

If the timer is used, it is now running.

Calling convention:ANSI C:

```
int          i_ReturnValue;  
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_StartTimerCounter1 (b_BoardHandle);
```

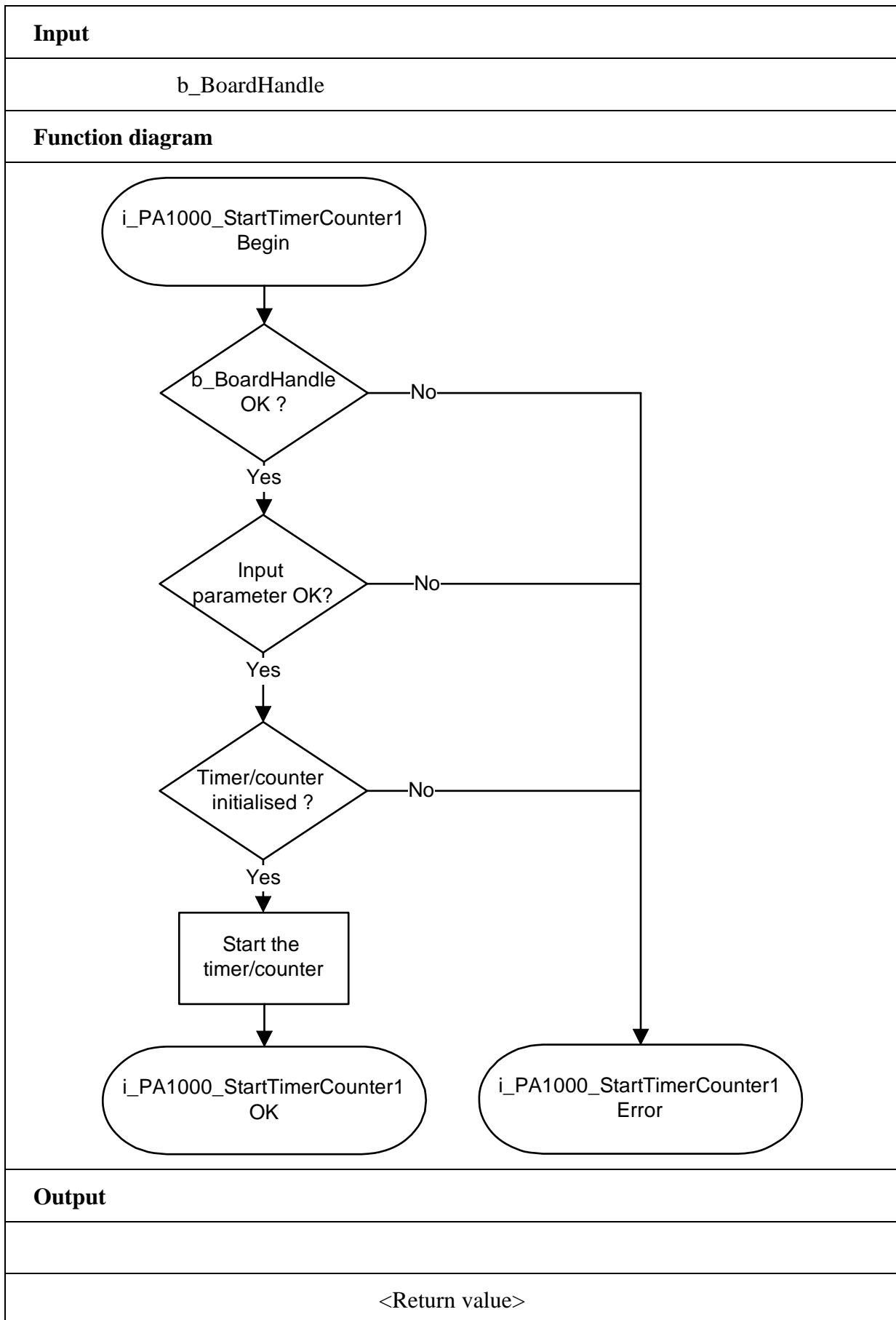
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised.

Please use function "i_PA1000_InitTimerCounter1"



5) i_PA1000_StartTimerCounter2 (...)

Syntax:

```
<Return value> = i_PA1000_StartTimerCounter2  
                  (BYTE_ b_BoardHandle)
```

Parameters:

- Input:

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Starts the second counter/timer. Please initialise it previously with the function "i_PA1000_InitTimerCounter2".

If the counter is used, it is now ready for counting.

If the timer is used, it is now running.

Calling convention:

ANSI C:

```
int                    i_ReturnValue;  
unsigned char    b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_StartTimerCounter2 (b_BoardHandle);
```

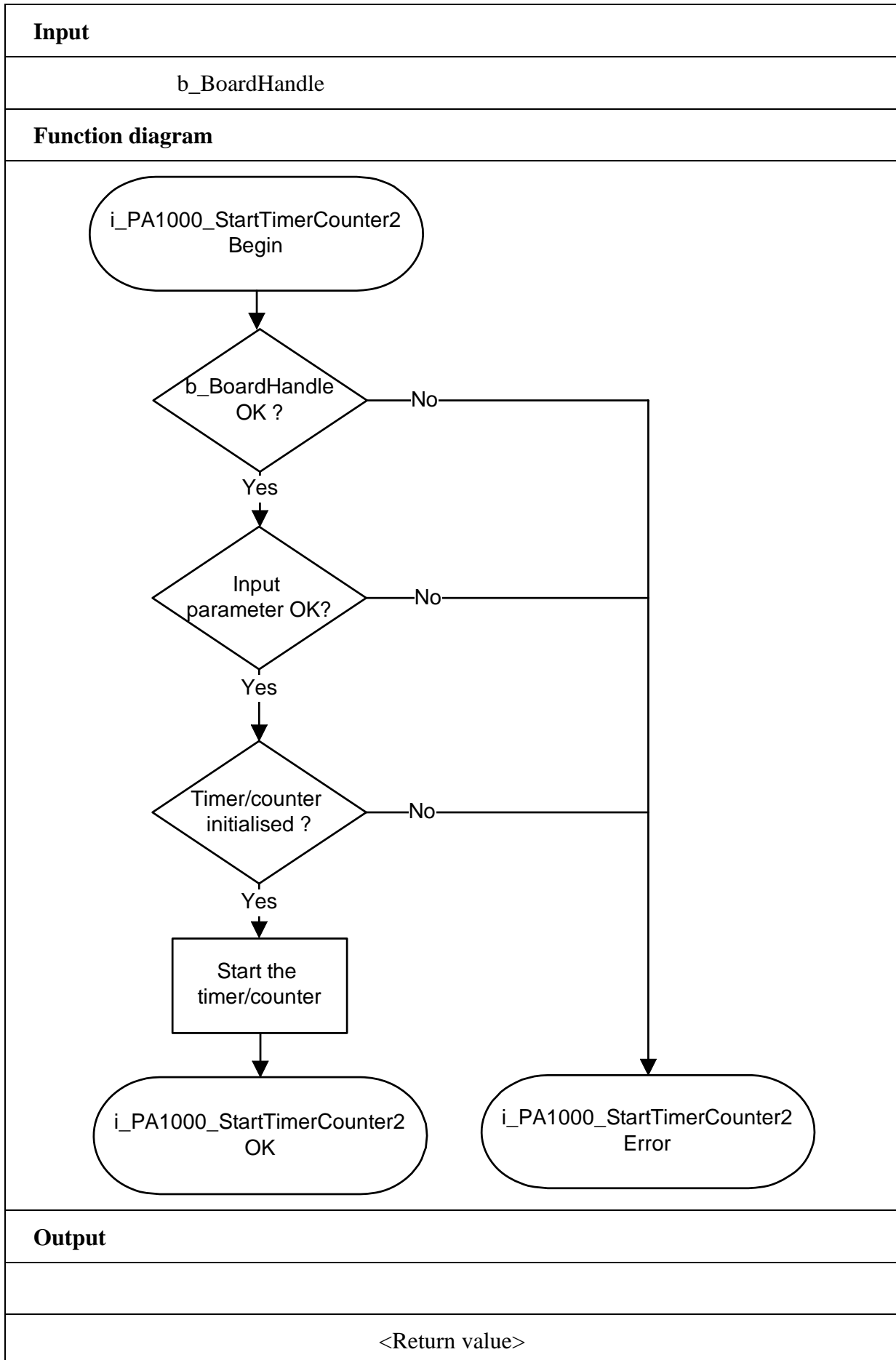
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised.

Please use function "i_PA1000_InitTimerCounter2"



6) i_PA1000_StartTimerCounter3 (...)**Syntax:**

<Return value> = i_PA1000_StartTimerCounter3
(BYTE_ b_BoardHandle)

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Starts the third counter/timer. Please initialise it previously with the function "i_PA1000_InitTimerCounter3".

If the counter is used, it is now ready for counting.

If the timer is used, it is now running.

Calling convention:ANSI C:

```
int          i_ReturnValue;  
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_StartTimerCounter3 (b_BoardHandle);
```

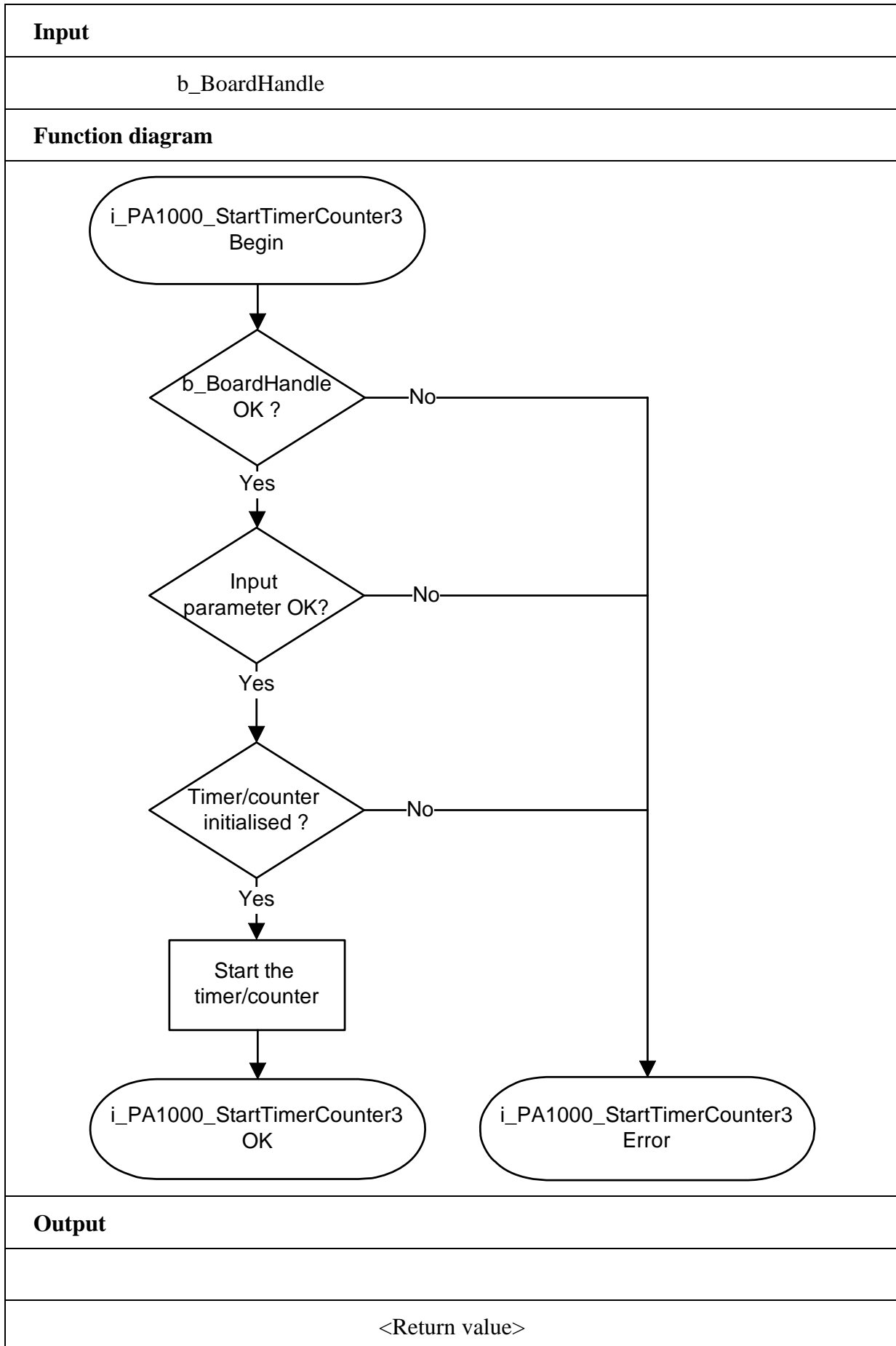
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised.

Please use function "i_PA1000_InitTimerCounter3"



7) i_PA1000_StopTimerCounter1 (...)**Syntax:**

```
<Return value> = i_PA1000_StopTimerCounter1
                    (BYTE_ b_BoardHandle)
```

Parameters:**- Input:**

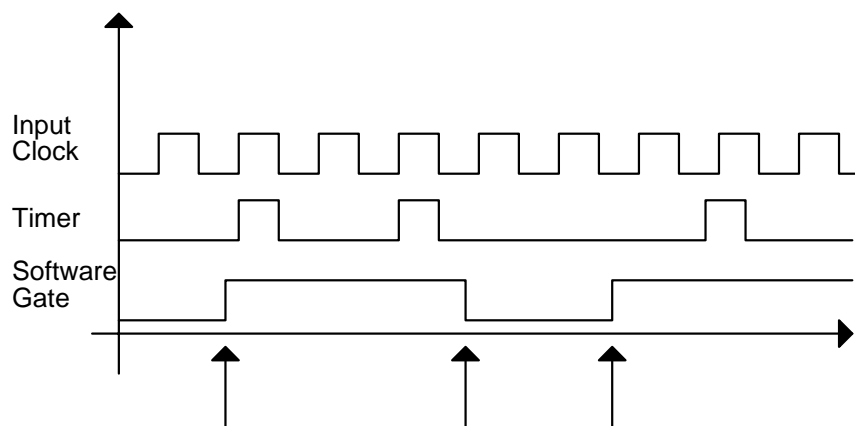
BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Stops the first counter/timer. The timer is stopped. It has the same influence as a hardware gate.



```
i_PA1000_StartTimerCounter1 (..)
```

```
  i_PA1000_StartTimerCounter1 (..)
```

```
          i_PA1000_StopTimerCounter1 (..)
```

Calling convention:ANSI C:

```
int            i_ReturnValue;
unsigned char  b_BoardHandle;
```

```
  i_ReturnValue = i_PA1000_StopTimerCounter1 (b_BoardHandle);
```

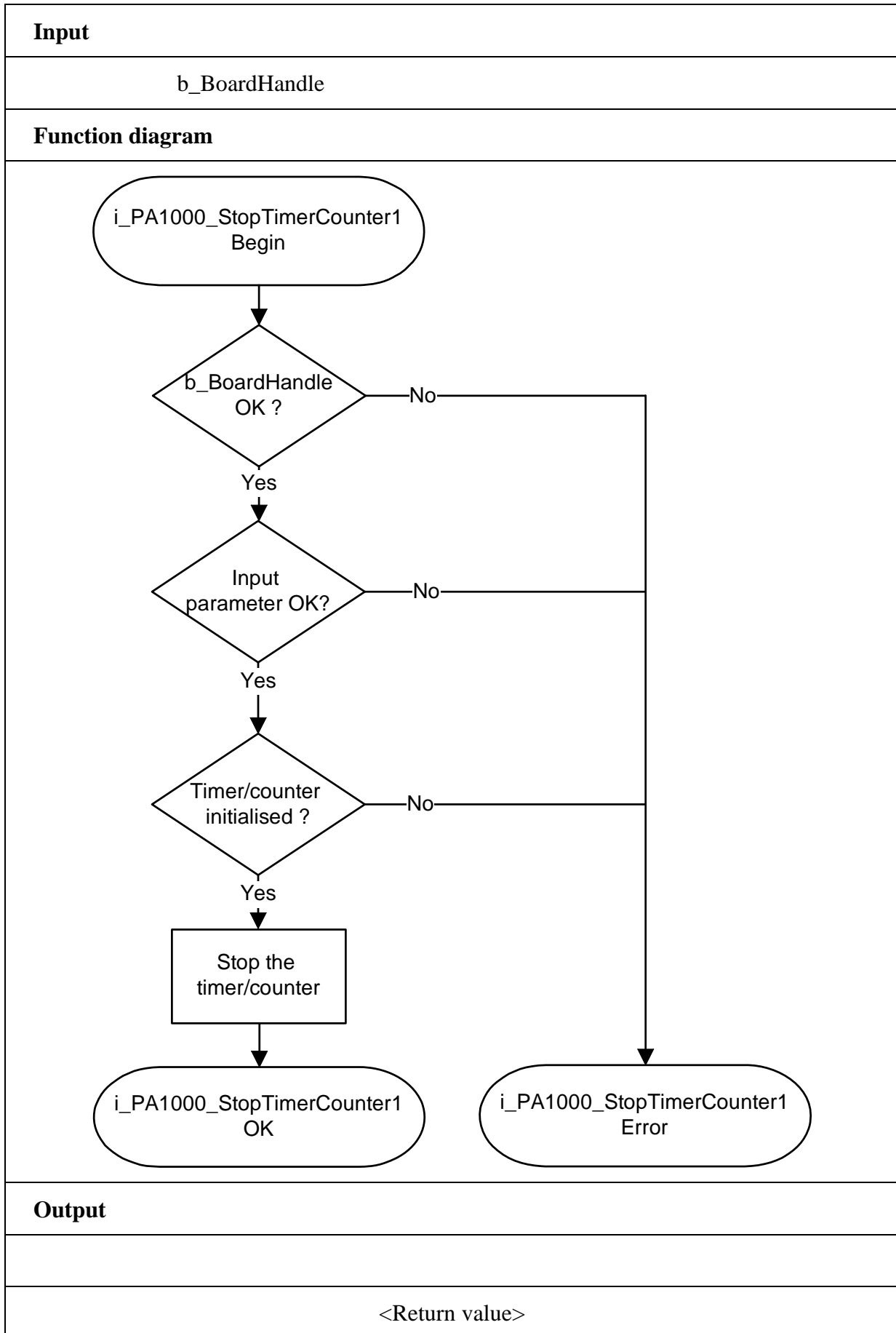
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: Counter/timer has not been initialised. Please use function

"i_PA1000_InitTimerCounter1"



8) i_PA1000_StopTimerCounter2 (...)**Syntax:**

<Return value> = i_PA1000_StopTimerCounter2
(BYTE_ b_BoardHandle)

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Stops the second counter/timer

Calling convention:ANSI C:

```
int                      i_ReturnValue;  
unsigned char    b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_StopTimerCounter2 (b_BoardHandle);
```

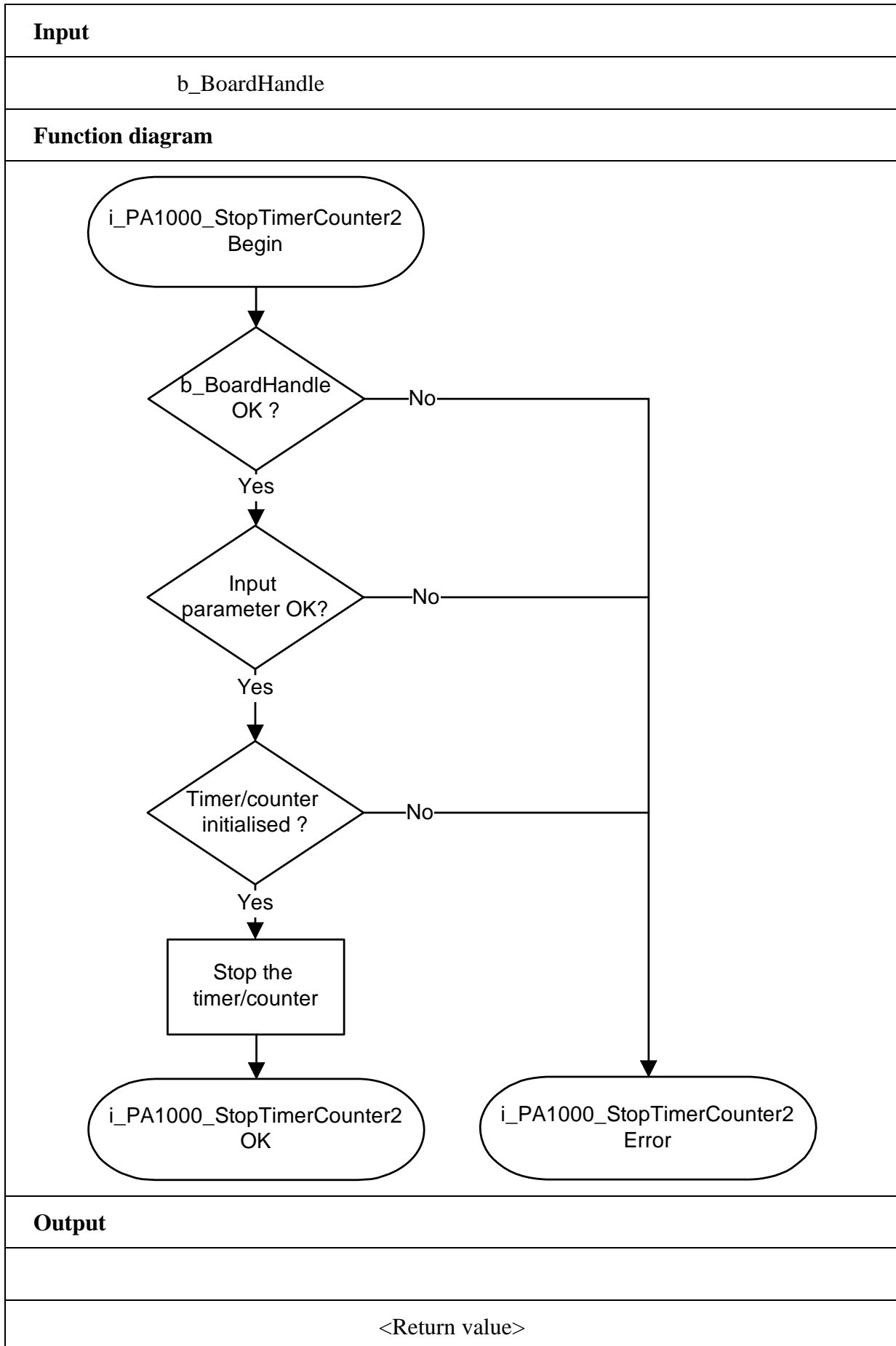
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised.

 Please use function "i_PA1000_InitTimerCounter2"



9) i_PA1000_StopTimerCounter3 (...)

Syntax:

```
<Return value> = i_PA1000_StopTimerCounter3  
                (BYTE_ b_BoardHandle)
```

Parameters:

- Input:

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Stops the third counter/timer.

Calling convention:

ANSI C:

```
int                      i_ReturnValue;  
unsigned char    b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_StopTimerCounter3 (b_BoardHandle);
```

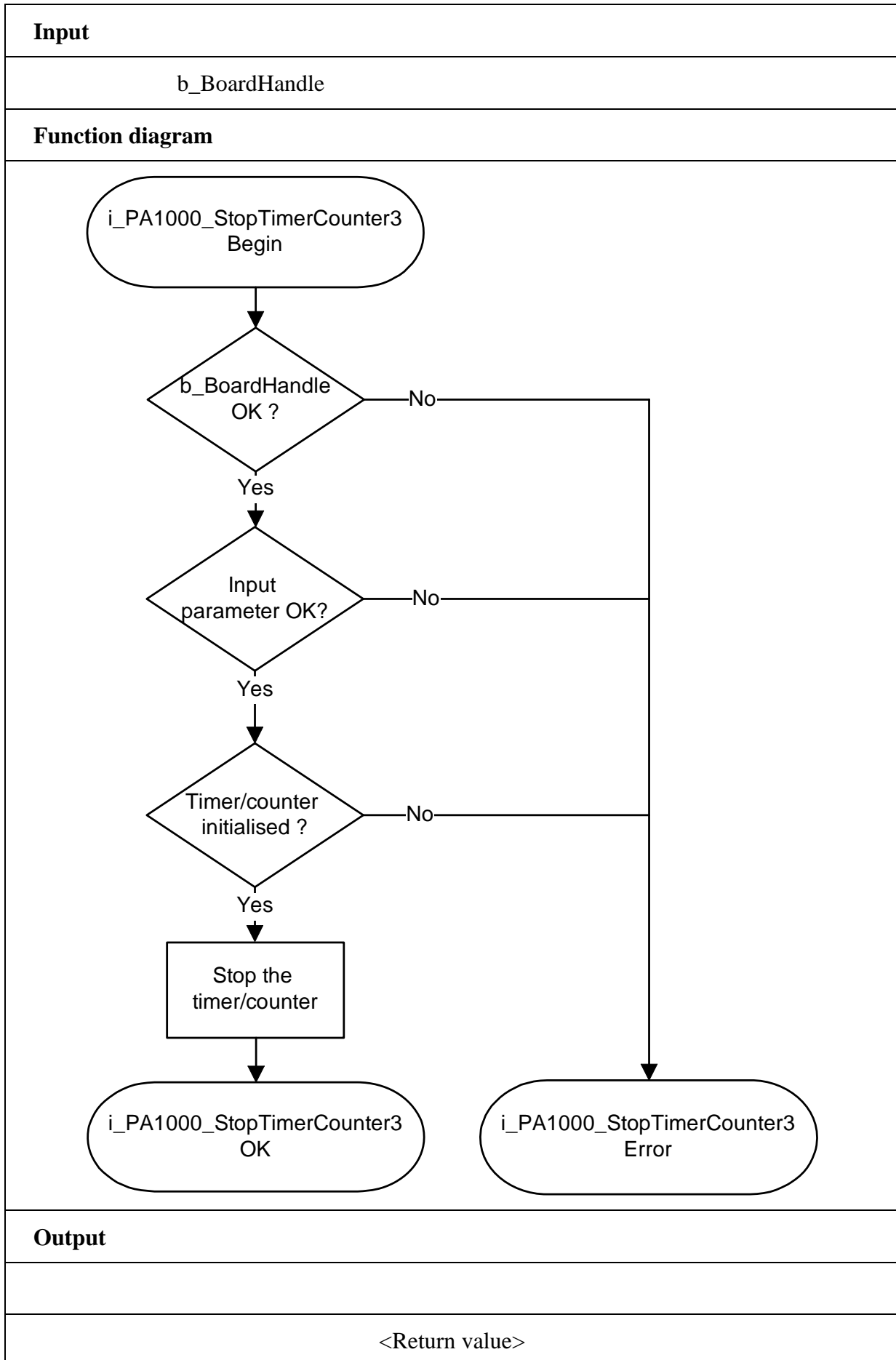
Return vaue:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised.

Please use function "i_PA1000_InitTimerCounter3"



10) i_PA1000_TriggerTimerCounter1 (...)**Syntax:**

<Return value> = i_PA1000_TriggerTimerCounter1
(BYTE_ b_BoardHandle)

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Triggers the first counter/timer. The start value is loaded in the counter/timer.

Calling convention:ANSI C:

```
int                      i_ReturnValue;  
unsigned char    b_BoardHandle;
```

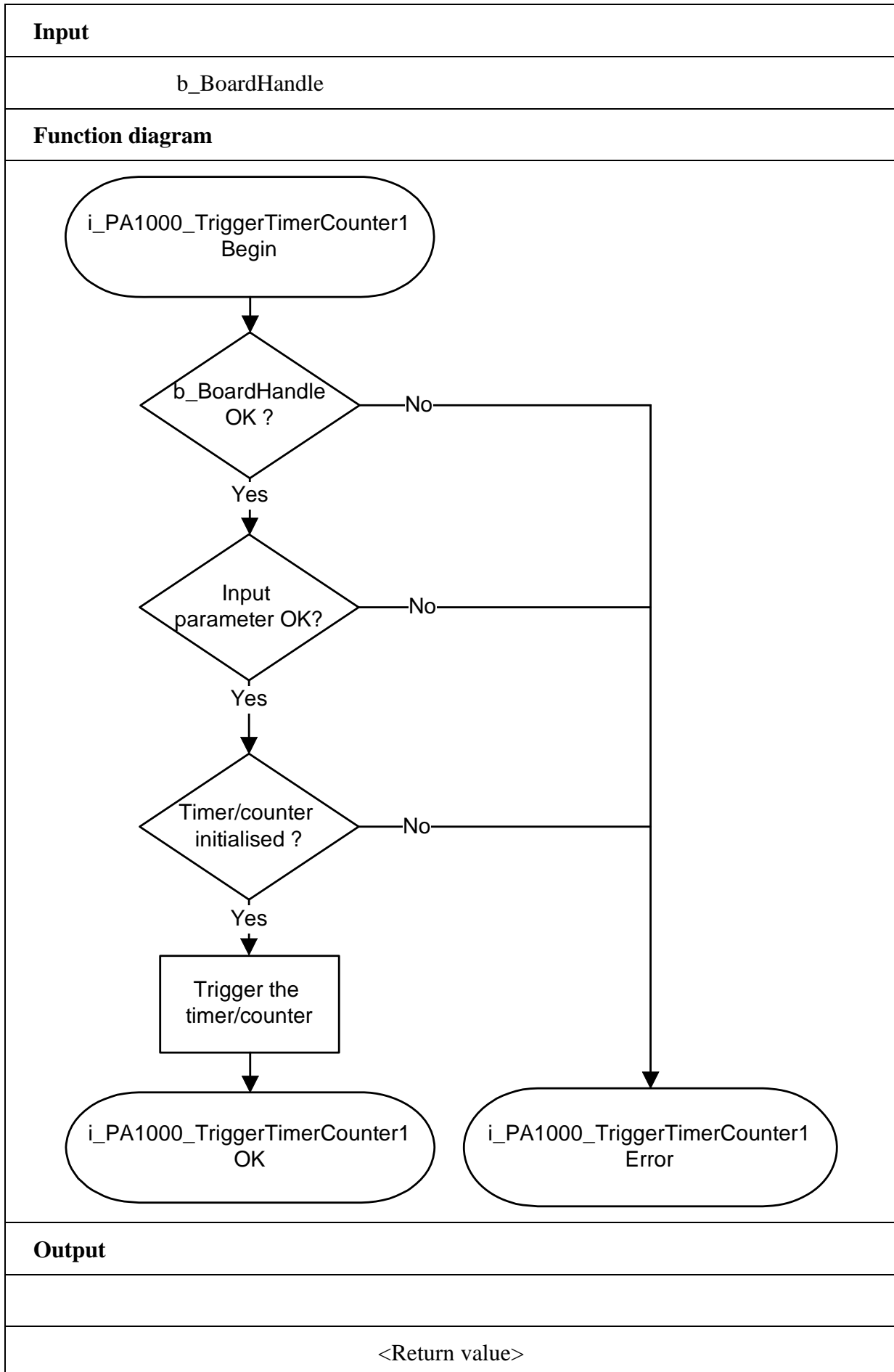
```
i_ReturnValue = i_PA1000_TriggerTimerCounter1 (b_BoardHandle);
```

Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised. Please use function
"i_PA1000_InitTimerCounter1"



11) i_PA1000_TriggerTimerCounter2 (...)**Syntax:**

<Return value> = i_PA1000_TriggerTimerCounter2
(BYTE_ b_BoardHandle)

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Triggers the second counter/timer. The start value is loaded in the counter/timer.

Calling convention:ANSI C:

```
int          i_ReturnValue;  
unsigned char b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_TriggerTimerCounter2 (b_BoardHandle);
```

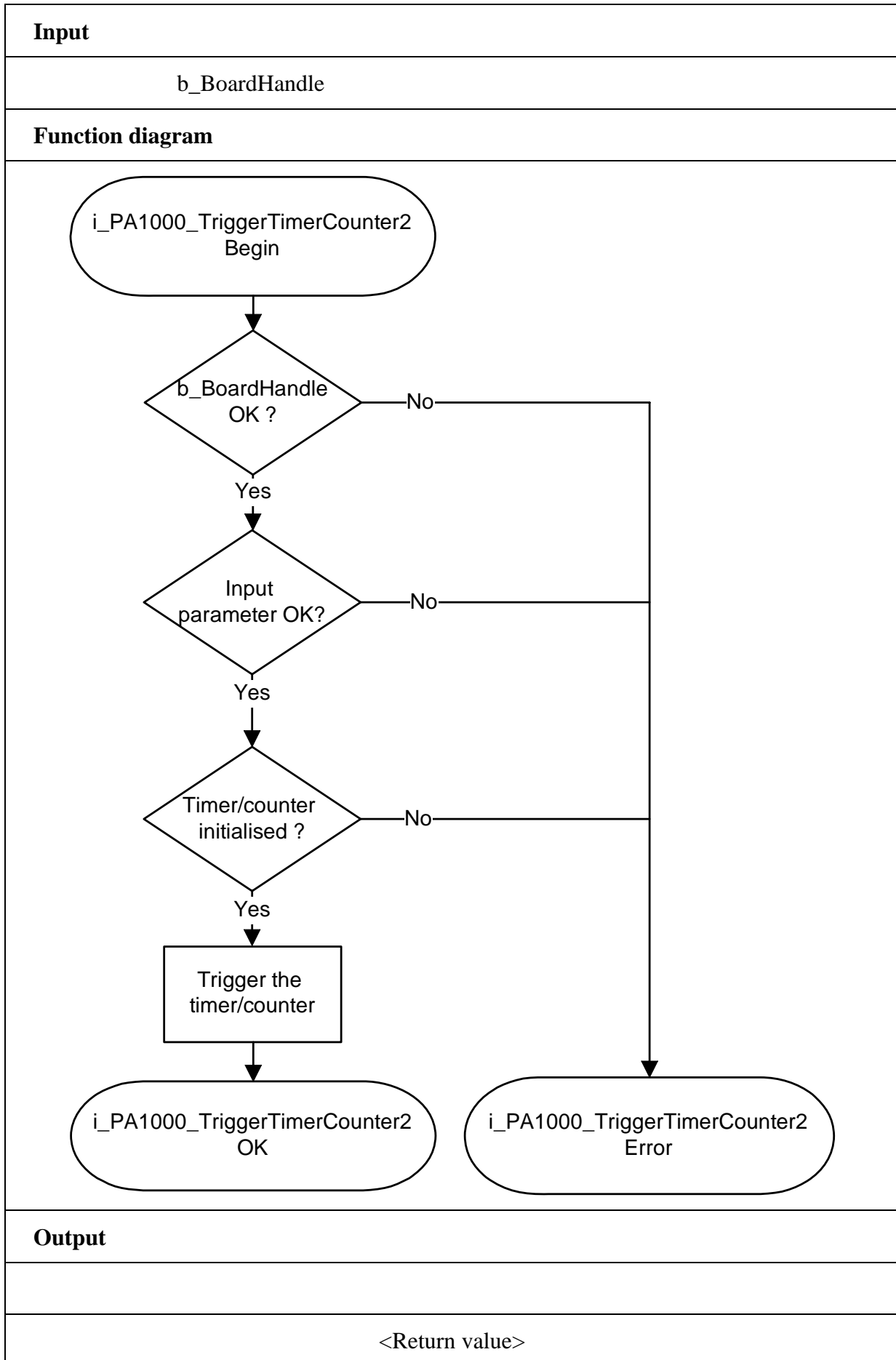
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised.

Please use function "i_PA1000_InitTimerCounter2"



12) i_PA1000_TriggerTimerCounter3 (...)

Syntax:

```
<Return value> = i_PA1000_TriggerTimerCounter3  
                                     (BYTE_ b_BoardHandle)
```

Parameters:

- Input:

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

No output signal has occurred

Task:

Triggers the third counter/timer. The start value is loaded in the counter/timer.

Calling convention:

ANSI C:

```
int                    i_ReturnValue;  
unsigned char    b_BoardHandle;
```

```
i_ReturnValue = i_PA1000_TriggerTimerCounter3 (b_BoardHandle);
```

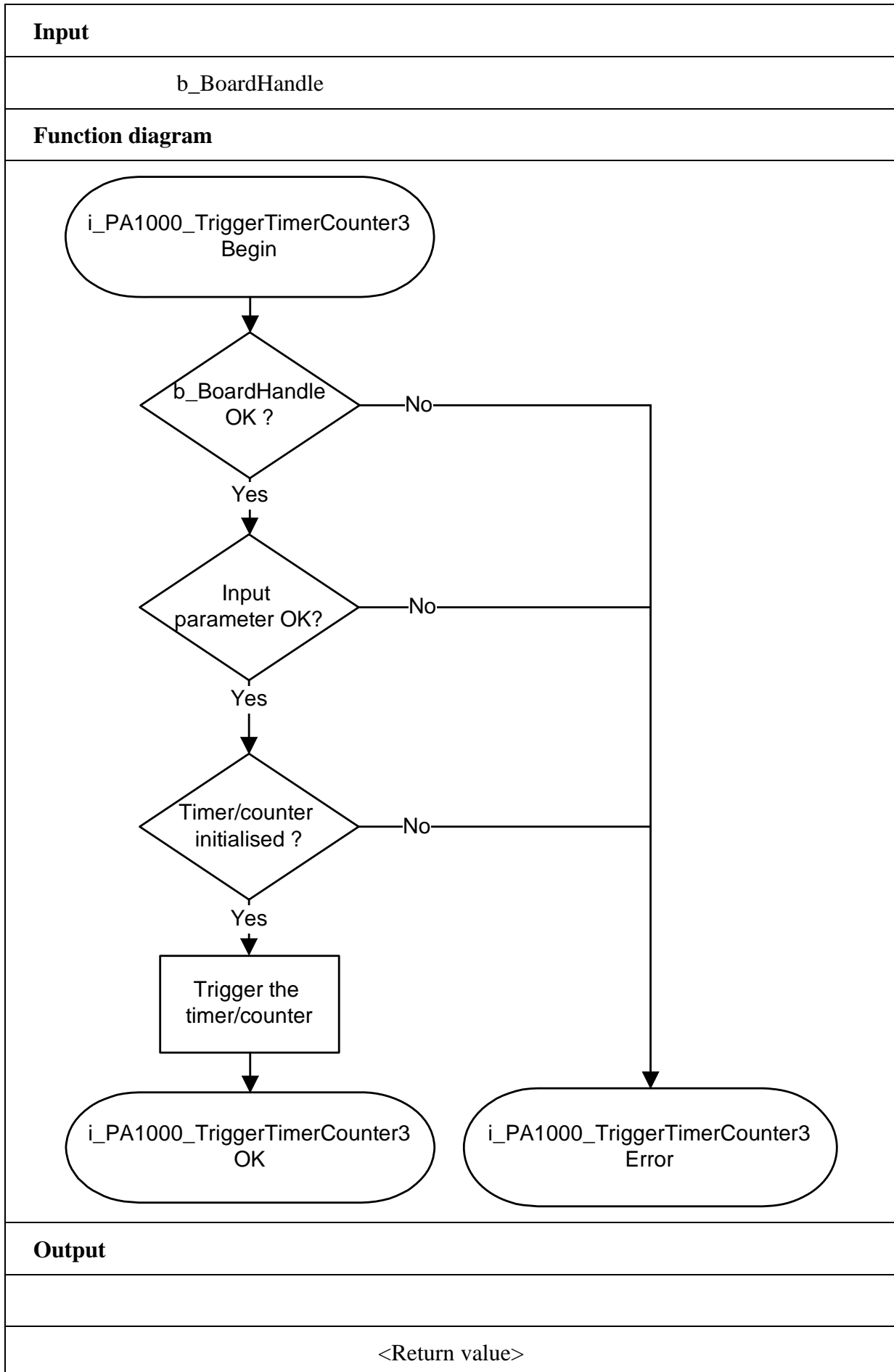
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised.

Please use function "i_PA1000_InitTimerCounter3"



13) i_PA1000_ReadTimerCounter1 (...)**Syntax:**

```
<Return value> = i_PA1000_ReadTimerCounter1
                                     (BYTE   b_BoardHandle,
                                     PLONG  pl_ReadValue)
```

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

PLONG pl_ReadValue This parameter has two meanings.
 When the counter/timer is used as a counter, it returns the current value of the counter.
 When the counter/timer is used as a timer, it returns the current value of the timer.

Task:

Reads the current value of the first counter/timer if used as a counter
 Reads the timer content if used as a timer.

Counter: the counting value is decremented each time the input changes from low to high. The current counting value can be read with this function.

Timer: the timer value is decremented each time the input clock changes from low to high. The current timer value can be read with this function.

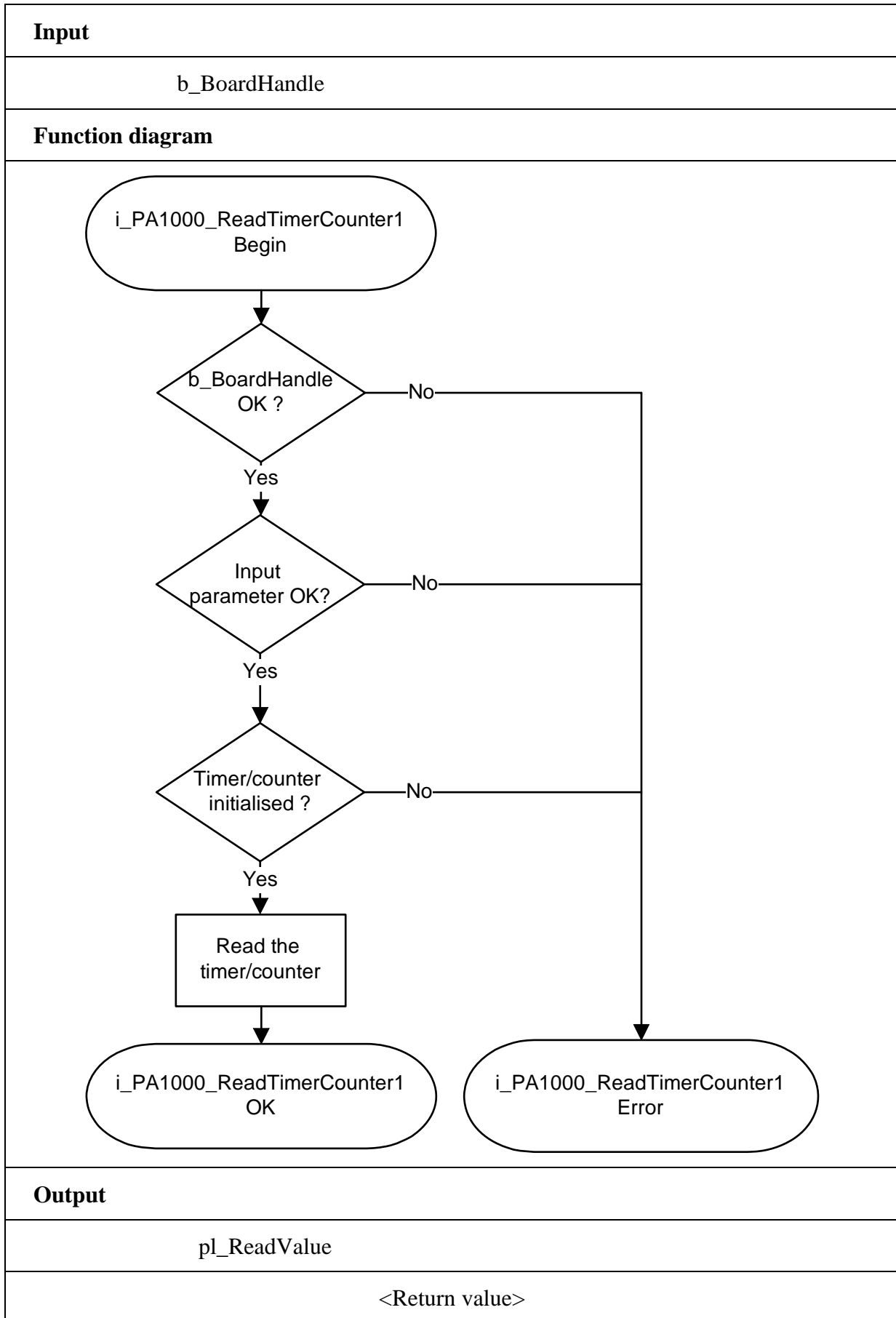
Calling convention:ANSI C:

```
int            i_ReturnValue;
unsigned char  b_BoardHandle;
long           l_ReadValue;
```

```
i_ReturnValue = i_PA1000_ReadTimerCounter1 (b_BoardHandle,
                                             &l_ReadValue);
```

Return value:

0: No error
 -1: The handle parameter of the board is wrong
 -2: The counter or timer has not been initialised.
 Please use function "i_PA1000_InitTimerCounter1"



14) i_PA1000_ReadTimerCounter2 (...)**Syntax:**

```
<Return value> = i_PA1000_ReadTimerCounter2
                                     (BYTE   b_BoardHandle,
                                     PLONG  pl_ReadValue)
```

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

PLONG pl_ReadValue This parameter has two meanings..
When the counter/timer is used as a counter, it returns the current value of the counter.
When the counter/timer is used as a timer, it returns the current value of the timer.

Task:

Reads the current value of the second counter/timer if used as a counter .

Reads the timer content if used as a timer.

Counter: the counting value is decremented each time the input changes from low to high. The current counting value can be read with this function.

Timer: the timer value is decremented each time the input clock changes from low to high. The current timer value can be read with this function.

Calling convention:ANSI C:

```
int            i_ReturnValue;
unsigned char  b_BoardHandle;
long           l_ReadValue;
```

```
i_ReturnValue = i_PA1000_ReadTimerCounter2 (b_BoardHandle,
                                             &l_ReadValue);
```

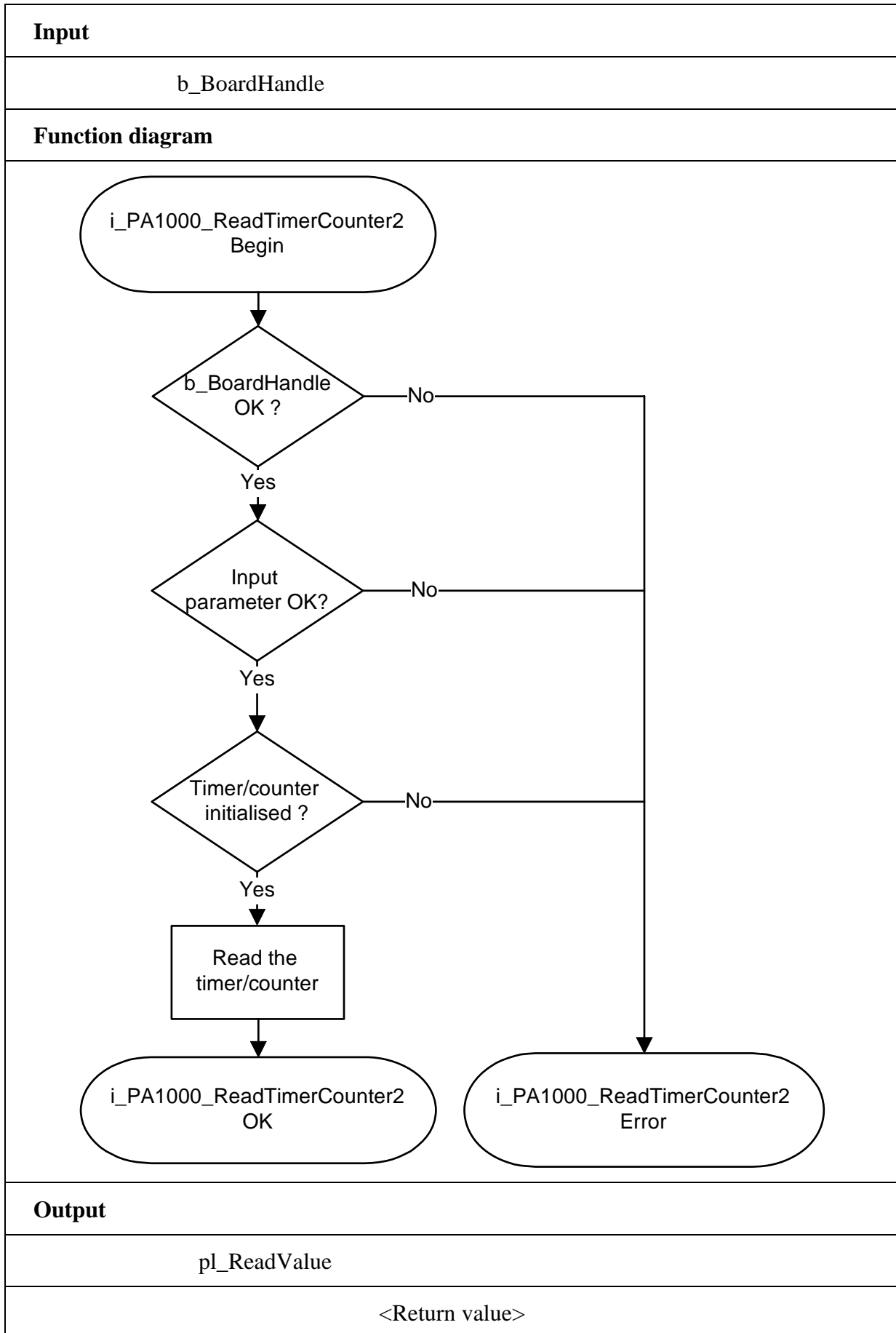
Return value:

0: No error

-1: The handle parameter of the board is wrong

-2: The counter or timer has not been initialised.

Please use function "i_PA1000_InitTimerCounter2"



15) i_PA1000_ReadTimerCounter3 (...)**Syntax:**

```
<Return value> = i_PA1000_ReadTimerCounter3
                                     (BYTE   b_BoardHandle,
                                     PLONG   pl_ReadValue)
```

Parameters:**- Input:**

BYTE b_BoardHandle Handle of board **PA 1000**

- Output:

PLONG pl_ReadValue This parameter has two meanings.
When the counter/timer is used as a counter
it returns the current value of the counter.
When the counter/timer is used as a timer,
it returns the current value of the timer.

Task:

Reads the current value of the third counter/timer if used as a counter.
Reads the timer content if used as a timer.

Counter: the counting value is decremented each time the input changes from low to high. The current counting value can be read with this function.

Timer: the timer value is decremented each time the input clock changes from low to high. The current timer value can be read with this function.

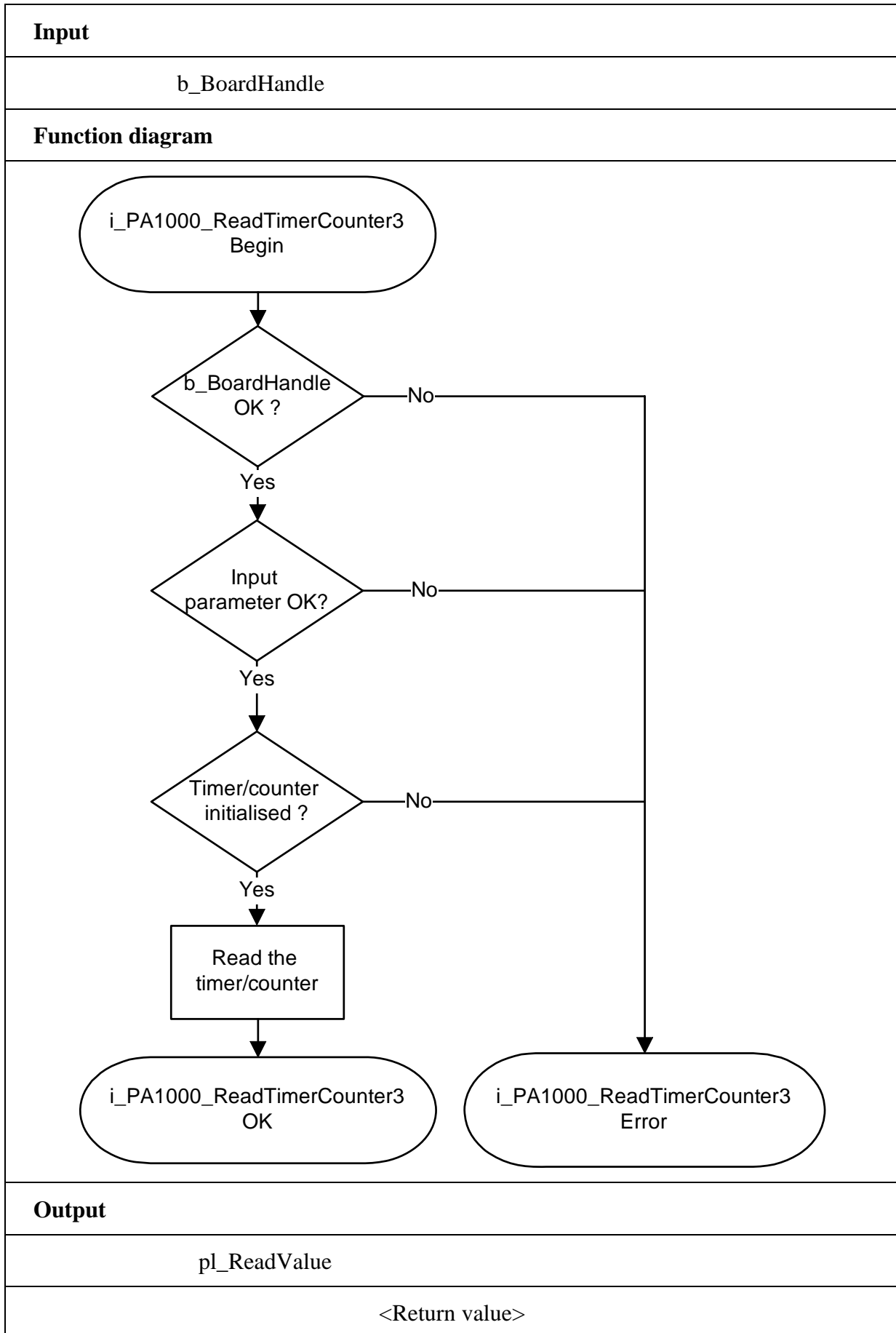
Calling convention:ANSI C :

```
int            i_ReturnValue;
unsigned char  b_BoardHandle;
long           l_ReadValue;
```

```
i_ReturnValue = i_PA1000_ReadTimerCounter3 (b_BoardHandle,
                                             &l_ReadValue);
```

Return value:

0: No error
-1: The handle parameter of the board is wrong
-2: The counter or timer has not been initialised.
Please use function "i_PA1000_InitTimerCounter3"



3.6 Compatibility functions for the former driver version (Windows NT/95)

The new PA1000 driver is based on a new driver technology.

With this driver the interrupt and I/O management is faster.

Therefore use the functions:

- "i_PA1000_SetBoardInformationWin32"

- "i_PA1000_SetBoardIntRoutineWin32"

i

IMPORTANT!

The functions "i_PA1000_SetBoardAddress" and i_PA1000_SetBoardIntRoutine" are only implemented for the former driver version used in your applications.

1) i_PA1000_SetBoardAddress (...)

Syntax:

```
<Return value> = i_PA1000_SetBoardAddress
                                     (UINT      ui_BaseAddress,
                                     BYTE       b_AccessMode,
                                     PBYTE     pb_BoardHandle)
```

Parameters:

- Input:

UINT	ui_BaseAddress	Base address of the PA 1000 board
BYTE	b_AccessMode	PA 1000 access mode
		- PA1000_8BIT : 8-bit access
		- PA1000_16BIT : 16-bit access

- Output:

PBYTE	pb_BoardHandle:	Handle ¹ of board PA 1000 to use the functions
-------	-----------------	--

Task:

Checks if the board **PA 1000** is present and stores the base address.

A handle is returned to the user which allows to use the following functions.

Handles allow to operate several boards.

Return value:

0: No error

-1: Board not present

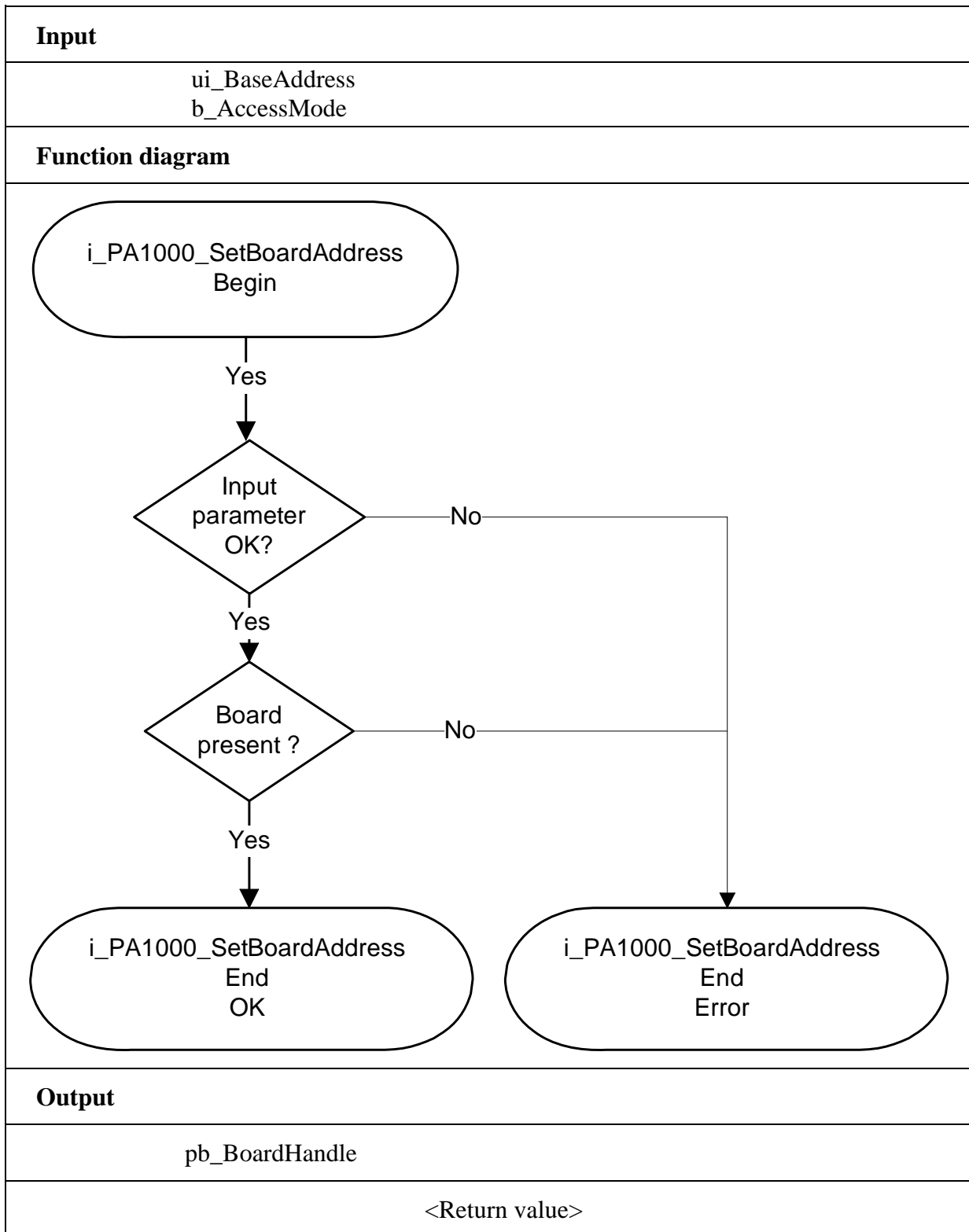
-2: Base address not available

-3: No handle is available for the board (up to 10 handles can be used)

-4: The parametered data bus width is wrong

PA1000_8BIT or PA1000_16BIT

¹ Identification number of the board



2) i_PA1000_SetBoardIntRoutine (..)

Syntax:

```
<Return value> = i_PA1000_SetBoardIntRoutineDos
    (BYTE    b_BoardHandle,
     BYTE    b_InterruptNbr,
     VOID    v_FunctionName (BYTE    b_BoardHandle,
                             BYTE    b_InterruptMask
                             BYTE    b_InputChannelNbr))
```

Parameters:

- Input:

BYTE	b_BoardHandle	Handle of board PA 1000
BYTE	b_InterruptNbr	PA 1000 interrupt number (3, 5, 10, 11, 12, 14 or 15)
VOID	v_FunctionName	Name of the user interrupt routine Pass this parameter only by the first calling of the function

- Output:

No output signal has occurred

Task:

This function must be called up for each **PA 1000** on which an interrupt action is to be enabled.

First calling (first board):

- the user interrupt routine is installed
- interrupts are enabled.

If you operate several boards **PA 1000** which have to react to interrupts, call up the function as often as you operate boards **PA 1000**.

The variable *v_FunctionName* is only relevant **for the first calling**.

From the second call of the function (next board):

- interrupts are enabled.

Interrupt

The user interrupt routine is called up by the system when an interrupt is generated.

If several boards are operated and if they have to react to interrupts, the variable *b_BoardHandle* returns the identification number (handle) of the board which has generated the interrupt.

An interrupt is generated when:

- the counter/timer has run down
- an event is generated

You can make the interrupt management easier with the function

„i_PA1000_SetBoardIntRoutine“

The user interrupt routine must have the following syntax:

```
VOID  v_FunctionName (BYTE b_BoardHandle,
                    BYTE   b_InterruptMask,
                    BYTE   b_InputChannelNbr)
```

v_FunctionName Name of the user interrupt routine
b_BoardHandle Handle of the **PA 1000** which has generated the interrupt
b_InterruptMask Mask of the events which have generated the interrupt.
b_InputChannelNbr If an interrupt is generated with a Mask 0000 0001 and if you use the OR-PRIORITY logic, this variable gives the input number which have generated the interrupt.

Mask	Meaning
0000 0001	Event 1 has occurred
0000 0010	Event 2 has occurred
0000 0100	Counter/timer 1 has run down
0000 1000	Counter/timer 2 has run down
0001 0000	Counter/timer 3 has run down

The user can give another name for *v_FunctionName*, *b_BoardHandle*, *b_InterruptMask*, *b_InputChannelNbr*.

Calling convention:

ANSI C:

```
void    v_FunctionName    (unsigned char  b_BoardHandle,
                          unsigned char  b_InterruptMask,
                          unsigned int   b_InputChannelNumber)
    {
        .
        .
    }

int      i_ReturnValue;
unsigned char  b_BoardHandle;
unsigned char  b_InterruptNbr;

i_ReturnValue = i_PA1000_SetBoardIntRoutineDos (b_BoardHandle,
                                                b_InterruptNbr,
                                                v_FunctionName );
```

Return value:

0: No error
-1: The handle parameter of the board is wrong
-2: Interrupt already installed
-3: Interrupt number error

