ABB Drives

**Application Guide**

# Adaptive Program

Adaptive Program

# Application Guide

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# Introduction to the guide

## Chapter overview

The chapter gives general information on the guide.

## Compatibility

The guide complies with the drive application programs in which the Adaptive Programming features are included.

## Safety instructions

Follow all safety instructions delivered with the drive.

- Read the **complete safety instructions** before you install, commission or use the drive. The complete safety instructions are given at the beginning of the Hardware Manual.
- Read the **software function specific warnings and notes** before changing the default settings of the function. For each function, the warnings and notes are given in the Firmware Manual in the subsection describing the related user-adjustable parameters.

## Reader

The reader of the manual is expected to:

- know the standard electrical wiring practices, electronic components and electrical schematic symbols.
- have no experience or training in installing, operating or servicing of ABB drives.

## Use

The guide is to be used together with the firmware manual of the drive application program. The firmware manual contains the basic information on the drive parameters including the parameters of the Adaptive Program. The guide gives more detailed information on the Adaptive Program:

- what the Adaptive Program is
- how to build a program
- how the function blocks operate
- how to document the program
- the parameters and actual signals of ACS 800 Standard Application Program essential for the Adaptive Program.

## Related publications

The user documentation of the drive also includes:

- Firmware manual (the appropriate manual is delivered with the unit)
- Hardware manual (the appropriate manual is delivered with the unit)
- Guides/supplements for the optional equipment and programs (appropriate manuals are included in the delivery).

# Adaptive Program

## Chapter overview

The chapter describes the basics of the Adaptive Program and instructs in building a program.

## What is the Adaptive Program

Conventionally, the user can control the operation of the drive by parameters. Each parameter has a fixed set of choices or a setting range. The parameters make the programming easy, but the choices are limited: you cannot customise the operation any further. The Adaptive Program makes freer customising possible without the need of a special programming tool or language:

- The program is built of function blocks.
- The control panel is the programming tool.
- The user can document the program by drawing it on block diagram template sheets.

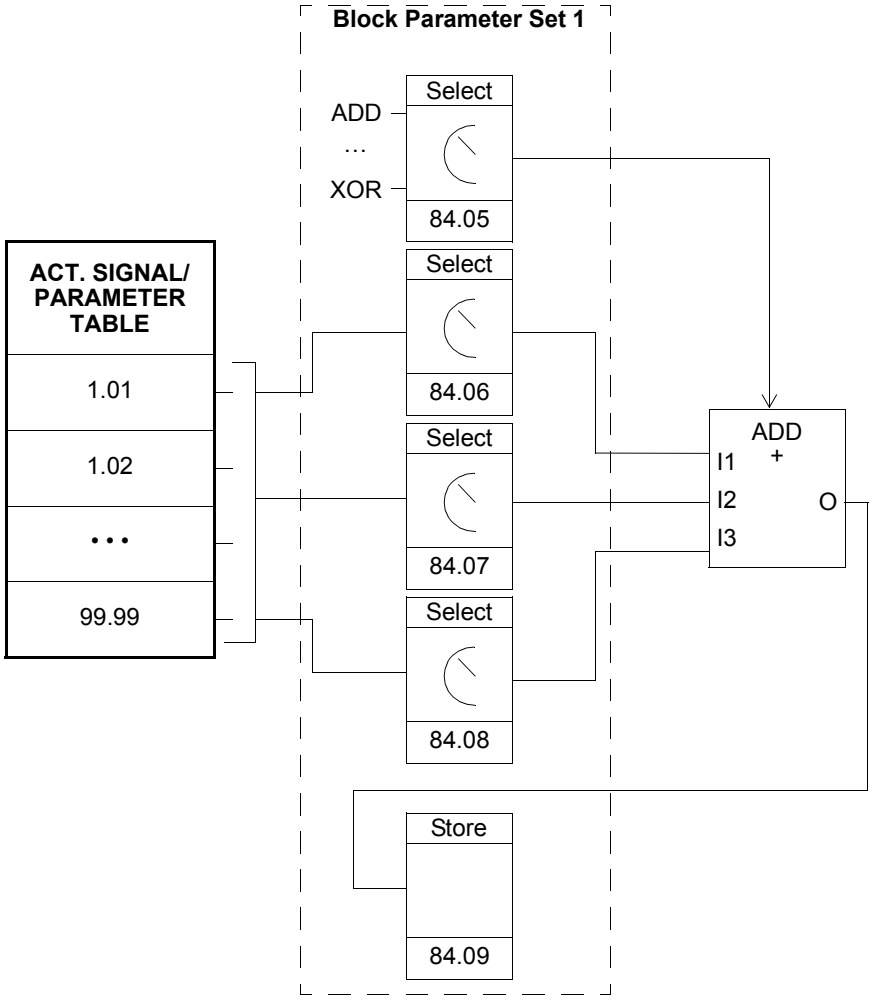
The maximum size of the Adaptive Program is 15 function blocks. The program may consist of several separate functions.

# How to build the program

The programmer connects a function block to other blocks through a Block Parameter Set. The sets are also used for reading values from the drive application program and transferring data to the drive application program. Each Block Parameter Set consists of five parameters.

The figure shows the use of Block Parameter Set 1 in the ACS 800 Standard Application Program (parameters 84.05 to 84.09):

- Parameter 84.05 selects the function block type.
- Parameter 84.06 selects the source that input I1 of the function block is connected to.
- Parameter 84.07 selects the source that input I2 of the function block is connected to.
- Parameter 84.08 selects the source that input I3 of the function block is connected to.
- Parameter 84.09 stores the value of the function block output. The user cannot edit the parameter value.



## How to connect the program to the drive application

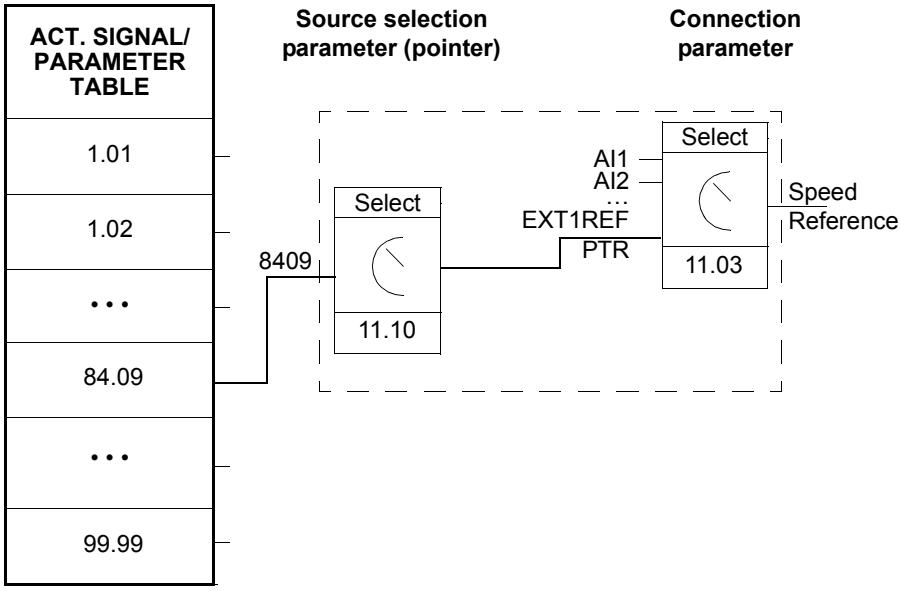
The output of the Adaptive Program needs to be connected to the drive application program. For that purpose the user needs two parameters:

- a connection parameter and
- a source selection parameter (pointer).

The figure below shows the connection principle.

**Example:**

The Adaptive Program output is stored in parameter 84.09. The diagram shows how to use the value as speed reference REF1 in the ACS 800 Standard Application Program.




## How to control the execution of the program

The Adaptive Program executes the function blocks in numerical order, all blocks on the same time level. This cannot be changed by the user. The user can:

- select the operation mode of the program (stop, start, editing)
- adjust the execution time level of the program
- delete or add blocks.

# Function blocks

## Chapter overview

The chapter describes the function blocks.

## General rules

**The use of input I1 is compulsory (it must not be left unconnected).** Use of input I2, I3, etc. is voluntary for the most blocks. As a rule of thumb, a unconnected input does not affect the output of the block.

## Block inputs

The blocks use three input formats:

- integer
- boolean
- text string

The used format varies depending on the block. For example, the ADD block uses integer inputs and the OR block boolean inputs. Text string format is used only by the EVENT block.

---

**Note:** The inputs of the block are read when the execution of the block starts, not simultaneously for all blocks!

---

### Parameter value as an integer input

*How the block handles the input*

The block reads the selected value in as an integer.

---

**Note:** The parameter selected as an input should be a real or integer value. If the value is not in integer format by default, the block converts it. The integer (fieldbus) scaling for each parameter is given in the *Firmware Manual.*

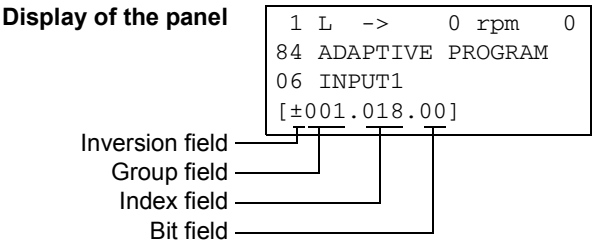
---

*How to select the input*

- Scroll to the input selection parameter of the block and switch to edit mode (Enter).
- Set the values of the inversion, group, index and bit fields according to the address from which the input value is to be read (double arrow and arrow keys).

The figure below shows the panel display when the input I1 selection parameter is in edit mode. The value is inverted if there is a minus ( - ) sign in the inversion field. The bit selection field is not effective for an integer or string type input.

**Display of the panel**




**Example:** Analogue input AI1 is 5.8 V in a drive equipped with the ACS 800 Standard Application Program. How is the signal connected to the MAX block in the Adaptive Program? What is the value at the block input?

AI1 is connected to the block as follows:

- Scroll to the input I1 selection parameter and shift to edit mode (Enter).
- Set the value in the group field to 1 and the value in the index field to 18. (Value of AI1 is internally stored as actual signal 1.18.)

The value at the input of the block is 5800, since the integer scaling of actual signal 1.18 is: 0.001 V = 1 (given in the *Firmware Manual*).

### Constant as an integer input

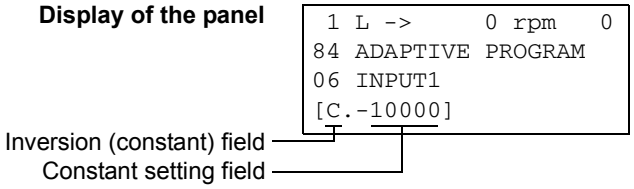
*How to set and connect the input*

Option 1

- Scroll to the input selection parameter of the block and switch to edit mode (Enter).
- Select C in the inversion field (double arrow and arrow keys). The appearance of the row changes. The rest of the line is now a constant field.
- Give the constant value to the constant field (double arrow and arrow keys).
- Accept by Enter.

The figure below shows the panel display when the input I1 selection parameter is in edit mode and the constant field is visible. The constant may have a value from -32768 to 32767. The constant cannot be changed while the adaptive program is running.

**Display of the panel**




Option 2

- Set the constant to one of the parameters reserved for the constants.
- Connect the constant value to a block as usual by the input selection parameter.

The constants can be changed while the adaptive program is running. They may have values from –8388608 to 8388607.

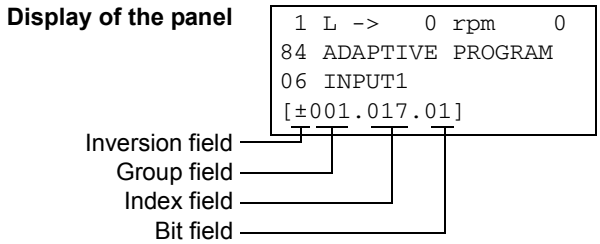
### Parameter value as a boolean input

*How the block handles the input*

- The block reads the selected value as an integer.
- The block uses the bit defined by the bit field as the boolean input.

Bit value 1 is boolean value true and 0 is boolean value false.

**Example:** The figure below shows the value of input I1 selection parameter when the input is connected to a bit indicating the status of digital input DI2. (In ACS 800 Standard Application Program, the digital input states are internally stored as actual signal 1.17 DI6-1 STATUS. Bit 1 corresponds to DI2, bit 0 to DI1.)




*How to select the input*

See the section *Parameter value as an integer input* above.

---

**Note:** The parameter selected as an input should have a packed boolean value (binary data word). See the Firmware Manual.

---

### Constant as a boolean input

*How to set and connect the input*

- Scroll to the input selection parameter of the block and switch to edit mode (Enter).
- Select C in the inversion field (double arrow and arrow keys). The rest of the line changes to a constant setting field.
- Give the constant. If boolean value true is needed, set the constant to -1. If boolean value false is needed, set to 0.
- Accept by Enter.

### String input

*How to select the input*

String input is needed only with the EVENT block.

For the input selection procedure, see the section *Parameter value as an integer input* above. The bit selection field is not effective.

---

**Note:** The parameter selected as an input must have a string value. In the ACS 800 Standard Application Program, there are parameters in group 85 USER CONSTANTS which can be used for string inputs.

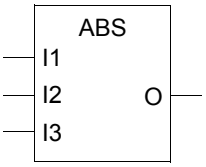
---

# Function blocks

## ABS

**Type** Arithmetic function

**Illustration**




**Operation** The output is the absolute value of input I1 multiplied by I2 and divided by I3.

$O = |I1| \cdot I2 / I3$

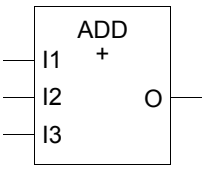
**Connections** Input I1, I2 and I3: 24 bit integer values (23 bits + sign)

Output (O): 24 bit integer (23 bits + sign)

## ADD

**Type** Arithmetic function

**Illustration**




**Operation** The output is the sum of the inputs.

O = I1 + I2 + I3

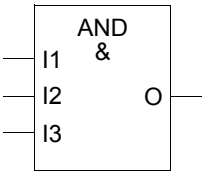
**Connections** Input I1, I2 and I3: 24 bit integer values (23 bits + sign)

Output (O): 24 bit integer (23 bits + sign)

## AND

**Type** Logical function

**Illustration**




**Operation** The output is true if all connected inputs are true. Otherwise the output is false.

Truth table:

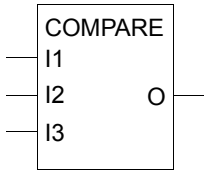
| **I1** | **I2** | **I3** | **O** (binary) | **O** (value on display) |
|---|---|---|---|---|
| 0 | 0 | 0 | False (All bits 0) | 0 |
| 0 | 0 | 1 | False (All bits 0) | 0 |
| 0 | 1 | 0 | False (All bits 0) | 0 |
| 0 | 1 | 1 | False (All bits 0) | 0 |
| 1 | 0 | 0 | False (All bits 0) | 0 |
| 1 | 0 | 1 | False (All bits 0) | 0 |
| 1 | 1 | 0 | False (All bits 0) | 0 |
| 1 | 1 | 1 | True (All bits 1) | -1 |

**Connections** Input I1, I2 and I3: Boolean values
Output (O): 24 bit integer value (packed boolean)

## COMPARE

**Type** Comparative function

**Illustration**




**Operation** Output bits 0, 1 and 2:

- If I1 > I2, O = … 001 (Output bit 0 is set.)
- If I1 = I2, O = … 010 (Output bit 1 is set.)
- If I1 < I2, O = … 100 (Output bit 2 is set.)

Output bit 3:

- If I1 > I2, O = … 1xxx (Output bit 3 is set and remains set until I1 < I2 - I3, after which bit 3 is reset.)

Output value on display:

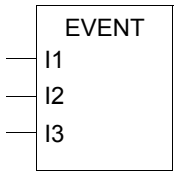
| **bit 0** | **bit 1** | **bit 2** | **bit 3** | **O** (value on display) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 | 2 |
| 0 | 0 | 1 | 0 | 4 |
| 0 | 0 | 0 | 1 | 8 |
| 1 | 0 | 0 | 1 | 9 |
| 0 | 1 | 0 | 1 | 10 |
| 0 | 0 | 1 | 1 | 12 |

**Connections** Input I1, I2 and I3: 24 bit integer values (23 bits + sign)
Output (O): 24 bit integer (packed boolean)

## EVENT

**Type** Event function

**Illustration**



**Operation** Input I1 triggers the event. I2 selects the parameter index from which the event message (text string) is read. I3 selects the type of the event (warning or fault).

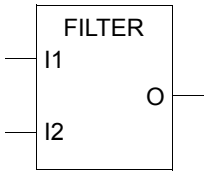
| I1 | I2 | I3 | Cause |
|---|---|---|---|
| 0->1 | | | block activates the event |
| 0 | | | block deactivates the event |
| | I2 | | contents of the event message |
| | | 0 | type of event: warning |
| | | 1 | type of event: fault |
| | | 2 | type of event: event |

**Connections** Input I1, I3: 24 bit integer values (23 bits + sign)
Input I2: String (compulsory)

## FILTER

**Type** Filtering function

**Illustration**



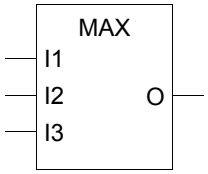

**Operation** The output is the filtered value of input I1. Input I2 is the filtering time.
$O = I1 \cdot (1 - e^{-t/I2})$
**Note:** The internal calculation uses 48 bits accuracy to avoid offset errors.

**Connections** Input I1: 24 bit integer value (23 bits + sign)
Input I2: 24 bit integer value (23 bits + sign). One corresponds to 1 ms.
Output (O): 24 bit integer (23 bits + sign)

## MAX

**Type** Comparative function

**Illustration**



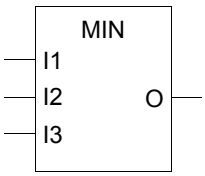

**Operation** The output is the highest input value.
O = MAX (I1, I2, I3)

**Connections** Input I1, I2 and I3: 24 bit integer values (23 bits + sign)
Output (O): 24 bit integer (23 bits + sign)

**MIN**

**Type** Comparative function

**Illustration**



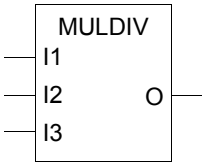

**Operation** The output is the lowest input value.
O = MIN (I1, I2, I3)

**Connections** Input I1, I2 and I3: 24 bit integer values (23 bits + sign)
Output (O): 24 bit integer (23 bits + sign)

**MULDIV**

**Type** Arithmetic function

**Illustration**



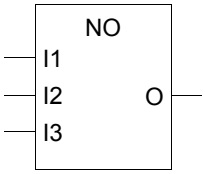

**Operation** The output is the product of input I1 and input I2 divided by input I3.
O = (I1 · I2) / I3

**Connections** Input I1, I2 and I3: 24 bit integer values (23 bits + sign)
Output (O): 24 bit integer (23 bits + sign)

**NO**

**Type** -

**Illustration**



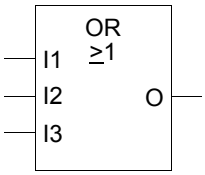

**Operation** The block does not do anything.

**Connections** -

**OR**

**Type** Logical function

**Illustration**



**Operation** The output is true if any of the inputs is true. Truth table:

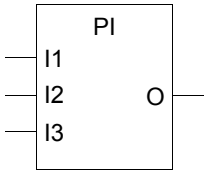
| **I1** | **I2** | **I3** | **O** (binary) | **O** (value on display) |
|---|---|---|---|---|
| 0 | 0 | 0 | False (All bits 0) | 0 |
| 0 | 0 | 1 | True (All bits 1) | -1 |
| 0 | 1 | 0 | True (All bits 1) | -1 |
| 0 | 1 | 1 | True (All bits 1) | -1 |
| 1 | 0 | 0 | True (All bits 1) | -1 |
| 1 | 1 | 0 | True (All bits 1) | -1 |
| 1 | 1 | 1 | True (All bits 1) | -1 |

**Connections** Input I1, I2 and I3: Boolean values
Output (O): 24 bit integer value (packed boolean)

## PI

**Type** PI controller

**Illustration**




**Operation** The output is input I1 multiplied by I2/100 plus integrated I1 multiplied by I3/100.
$O = I1 \cdot I2/100 + (I3/100) \cdot \int I1$
**Note:** The internal calculation uses 48 bits accuracy to avoid offset errors.

**Connections** Inputs I1: 24 bit integer value (23 bit + sign)
Input I2:
- 24 bit integer value (23 bit + sign)
- Gain factor. 100 corresponds to 1. 10 000 corresponds to 100.

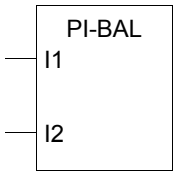
Input I3:
- Integrator coefficient. 100 corresponds to 1. 10 000 corresponds to 100.

Output (O): 24 bit integer (23 bits + sign). The range is limited to 0 … 10000.

## PI-BAL

**Type** Initialisation block for the PI controller

**Illustration**



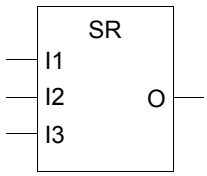

**Operation** The block initialises the PI block first. When input I1 becomes true, the block writes the value of I2 to the output of the PI block. When I1 becomes false, the block releases the output of the PI controller block which continues normal operation from the set output.
**Note:** The block may be used only with the PI block. The block must follow the PI block.

**Connections** Input I1: Boolean value
Input I2: 24 bit integer value (23 bits + sign)

## SR

**Type** Logical function

**Illustration**




**Operation** Set/reset block. Input I1 sets and I2 and I3 reset the output.

- If I1, I2 and I3 are false, the current value remains at the output.
- If I1 is true and I2 and I3 are false, the output is true.
- If I2 or I3 is true, the output is false.

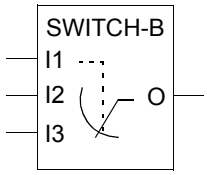
| **I1** | **I2** | **I3** | **O** (binary) | **O** (value on display) |
|---|---|---|---|---|
| 0 | 0 | 0 | Output | Output |
| 0 | 0 | 1 | False (All bits 0) | 0 |
| 0 | 1 | 0 | False (All bits 0) | 0 |
| 0 | 1 | 1 | False (All bits 0) | 0 |
| 1 | 0 | 0 | True (All bits 1) | -1 |
| 1 | 0 | 1 | False (All bits 0) | 0 |
| 1 | 1 | 0 | False (All bits 0) | 0 |
| 1 | 1 | 1 | False (All bits 0) | 0 |

**Connections** Input I1, I2 and I3: Boolean values
Output (O): 24 bit integer value (23 bits + sign)

## SWITCH-B

**Type** Logical function

**Illustration**




**Operation** The output is equal to input I2 if input I1 is true and equal to input I3 if input I1 is false.

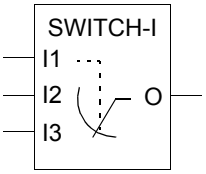
| **I1** | **I2** | **I3** | **O** | **O** (value on display) |
|---|---|---|---|---|
| 0 | I2 | I3 | I3 | True = -1 |
| 1 | I2 | I3 | I2 | False = 0 |

**Connections** Input I1, I2 and I3: Boolean values
Output (O): 24 bit integer value (packed boolean)

## SWITCH-I

**Type** Logical function

**Illustration**




**Operation** The output is equal to input I2 if input I1 is true and equal to input I3 if input I1 is false.

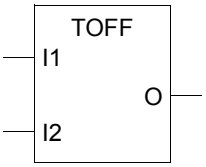
| I1 | I2 | I3 | O |
|---|---|---|---|
| 0 | I2 | I3 | I3 |
| 1 | I2 | I3 | I2 |

**Connections**
Input I1: Boolean value
Input I2 and I3: 24 bit integer values (23 bits + sign)
Output (O): 24 bit integer value (23 bits + sign)

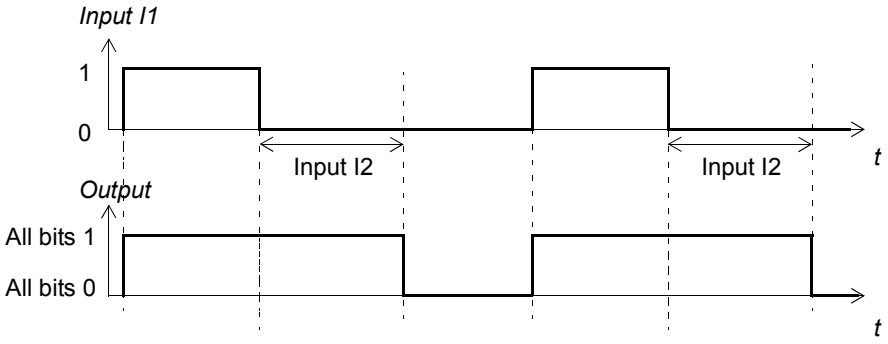
## TOFF

**Type** Timing function

**Illustration**




**Operation** The output is true when input I1 is true. The output is false when input I1 has been false for a time equal or longer than input I2.



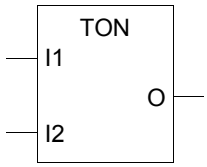

Values on display: True = -1, false = 0.

**Connections**
Input I1: Boolean value
Input I2: 24 bit integer value (23 bits + sign). One corresponds to 1 ms.
Output (O):
- 24 bit integer value (packed boolean)

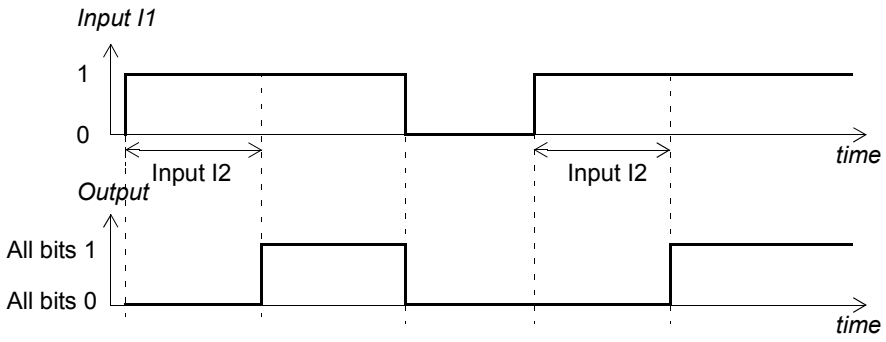
## TON

**Type** Timing function

**Illustration**




**Operation** The output is true when input I1 has been true for a time equal or longer than input I2. The output is false when the input is false.



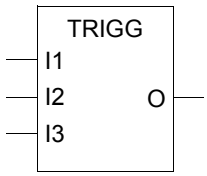

Values on display: True = -1, false = 0.

**Connections** Input I1: Boolean value
Input I2: 24 bit integer value (23 bits + sign). 1 corresponds to 1 ms.
Output (O): 24 bit integer value (packed boolean)

## TRIGG

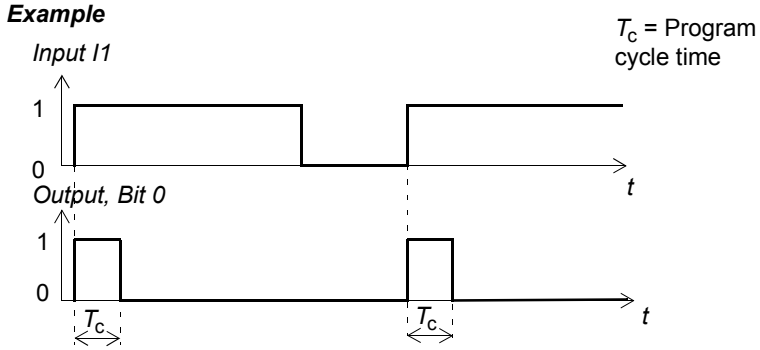
**Type** Timing function

**Illustration**




**Operation** The rising edge of input I1 sets the output bit 0 for one program cycle.
The rising edge of input I2 sets the output bit 1 for one program cycle.
The rising edge of input I3 sets the output bit 2 for one program cycle.

***Example***

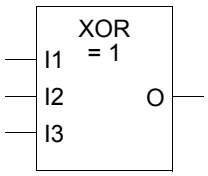


**Connections** Input I1, I2 and I3: Boolean values
Output (O):
- 24 bit integer value (23 bits + sign)

## XOR

**Type** Logical function

**Illustration**




**Operation** The output is true if one input is true, otherwise the output is false. Truth table:

| **I1** | **I2** | **I3** | **O** (binary) | **O** (value on display) |
|---|---|---|---|---|
| 0 | 0 | 0 | False (All bits 0) | 0 |
| 0 | 0 | 1 | True (All bits 1) | -1 |
| 0 | 1 | 0 | True (All bits 1) | -1 |
| 0 | 1 | 1 | False (All bits 0) | 0 |
| 1 | 0 | 0 | True (All bits 1) | -1 |
| 1 | 0 | 1 | False (All bits 0) | 0 |
| 1 | 1 | 0 | False (All bits 0) | 0 |
| 1 | 1 | 1 | True (All bits 1) | -1 |

**Connections** Input I1, I2 and I3: Boolean values
Output (O):
- 24 bit integer value (23 bits + sign)

# Actual signals and parameters in ACS 800 Standard Application Program

## Chapter overview

The chapter lists the actual signals, parameters and parameter values of ACS 800 Application Program that are essential for the Adaptive Programming.

## Actual signals

The table below lists the actual signals that are essential for the Adaptive Program.The abbreviation FbEq stands the fieldbus equivalent.

| Index | Signal Name/Value | Description | FbEq. |
|---|---|---|---|
| 09 | ACTUAL SIGNALS | Signals for the Adaptive Program | |
| 09.01 | AI1 SCALED | Value of analogue input AI1 scaled to an integer value. | 20000 = 10 V |
| 09.02 | AI2 SCALED | Value of analogue input AI2 scaled to an integer value. | 20000 = 20 mA |
| 09.03 | AI3 SCALED | Value of analogue input AI3 scaled to an integer value. | 20000 = 20 mA |
| 09.04 | AI5 SCALED | Value of analogue input AI5 scaled to an integer value. | 20000 = 20 mA |
| 09.05 | AI6 SCALED | Value of analogue input AI6 scaled to an integer value. | 20000 = 20 mA |
| 09.06 | MASTER CW | Control Word (CW) of the Main Reference Dataset received from the master station through the fieldbus interface. | -32768 … 32767 |
| 09.07 | MASTER REF1 | Reference 1 (REF1) of the Main Reference Dataset received from the master station through the fieldbus interface | -32768 … 32767 |
| 09.08 | MASTER REF2 | Reference 2 (REF2) of the Main Reference Dataset received from the master station through the fieldbus interface. | -32768 … 32767 |
| 09.09 | AUX DS VAL1 | Reference 3 (REF3) of the Auxiliary Reference Dataset received from the master station through the fieldbus interface. | -32768 … 32767 |
| 09.10 | AUX DS VAL2 | Reference 4 (REF4) of the Auxiliary Reference Dataset received from the master station through the fieldbus interface. | -32768 … 32767 |
| 09.11 | AUX DS VAL3 | Reference 5 (REF5) of the Auxiliary Reference Dataset received from the master station through the fieldbus interface. | -32768 … 32767 |

# Parameters

The table below lists the parameters and parameters values that are essential for the Adaptive Program. The abbreviation FbEq stands for fieldbus equivalent.

| Index | Parameter name / value | Description | FbEq |
|---|---|---|---|
| 10 | START/STOP/DIR | Parameters through which the Adaptive Program can control the start, stop and direction of the drive. | |
| 10.01 | EXT1 STRT/STP/DIR | | |
| | PARAM 10.04 | Source selected by 10.04 | 16 |
| 10.02 | EXT2 STRT/STP/DIR | | |
| | PARAM 10.05 | Source selected by 10.05. | 16 |
| 10.04 | EXT 1 STRT PTR | Selects the source for parameter 10.01. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value:<br>- Parameter pointer: Inversion, group, index and bit fields. The bit number is effective only for blocks handling boolean inputs.<br>- Constant value: Inversion and constant fields. The inversion field must have value C to enable the setting of the constant. | |
| 10.05 | EXT 2 STRT PTR | Selects the source for 10.02. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 11 | REFERENCE SELECT | Parameters through which the Adaptive Program can control the reference of the drive. | |
| 11.02 | EXT1/EXT2 SELECT | | |
| | PARAM 11.09 | Source selected by 11.09. | 16 |
| 11.03 | EXT REF1 SELECT | | |
| | PARAM 11.10 | Source selected by 11.10. | 37 |
| 11.06 | EXT REF2 SELECT | | |
| | PARAM 11.11 | Source selected by 11.11. | 37 |
| 11.09 | EXT 1/2 SEL PTR | Selects the source for 11.02. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 11.10 | EXT 1 REF PTR | Selects the source for 11.03. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 11.11 | EXT 2 REF PTR | Selects the source for 11.06. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14 | RELAY OUTPUTS | Parameters through which the Adaptive Program can control the relay outputs of the drive. | |
| 14.01 | RELAY RO1 OUTPUT | | |
| | PARAM 14.16 | Source selected by parameter 14.16. | 34 |
| 14.02 | RELAY RO2 OUTPUT | | |

| Index | Parameter name / value | Description | FbEq |
|---|---|---|---|
| | PARAM 14.17 | Source selected by parameter 14.17. | 34 |
| 14.03 | RELAY RO3 OUTPUT | | |
| | PARAM 14.18 | Source selected by parameter 14.18. | 34 |
| 14.10 | NDIO MOD1 RO1 | | |
| | PARAM 14.19 | Source selected by parameter 14.19. | 7 |
| 14.11 | NDIO MOD1 RO2 | | |
| | PARAM 14.20 | Source selected by parameter 14.20. | 7 |
| 14.12 | NDIO MOD2 RO1 | | |
| | PARAM 14.21 | Source selected by parameter 14.21. | 7 |
| 14.13 | NDIO MOD2 RO2 | | |
| | PARAM 14.22 | Source selected by parameter 14.22. | 7 |
| 14.14 | NDIO MOD3 RO1 | | |
| | PARAM 14.23 | Source selected by parameter 14.23. | 7 |
| 14.15 | NDIO MOD3 RO2 | | |
| | PARAM 14.24 | Source selected by parameter 14.24. | 7 |
| 14.16 | RO PTR1 | Selects the source for parameter 14.01. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14.17 | RO PTR2 | Selects the source for parameter 14.02. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14.18 | RO PTR3 | Selects the source for parameter 14.03. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14.19 | RO PTR4 | Selects the source for parameter 14.10. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14.20 | RO PTR5 | Selects the source for parameter 14.11. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14.21 | RO PTR6 | Selects the source for parameter 14.12. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14.22 | RO PTR7 | Selects the source for parameter 14.13. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14.23 | RO PTR8 | Selects the source for parameter 14.14. | |

| Index | Parameter name / value | Description | FbEq |
|---|---|---|---|
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 14.24 | RO PTR9 | Selects the source for parameter 14.15. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 15 | ANALOGUE OUTPUTS | Parameters through which the Adaptive Program can control the standard analogue outputs of the drive. | |
| 15.01 | ANALOGUE OUTPUT1 | | |
| | PARAM 15.11 | Source selected by 15.11 | 17 |
| 15.06 | ANALOGUE OUTPUT2 | | |
| | PARAM 15.12 | Source selected by 15.12 | 16 |
| 15.11 | AO1 PTR | Selects the source for parameter 15.01. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 15.12 | AO2 PTR | Selects the source for parameter 15.06. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 16 | SYSTEM CTRL INPUTS | Parameters through which the Adaptive Program can control the system control inputs of the drive. | |
| 16.01 | RUN ENABLE | | |
| | PARAM 16.08 | Source selected by parameter 16.08. | 15 |
| 16.08 | RUN ENA PTR | Selects the source for parameter 16.01 | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 20 | LIMITS | Parameters through which the Adaptive Program can control the operation limits of the drive. | |
| 20.13 | MIN TORQ SEL | Selects the torque minimum limit | |
| | PARAM 20.18 | Limit given by 20.18 | 19 |
| 20.14 | MAX TORQ SEL | Selects the torque maximum limit | |
| | PARAM 20.19 | Limit given by 20.19 | 19 |
| 20.18 | TORQ MIN PTR | Selects the source for 20.13 | 100 = 1% |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 20.19 | TORQ MAX PTR | Selects the source for 20.14 | 100 = 1% |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 22 | ACCEL/DECEL | Parameters through which the Adaptive Program can control the acceleration and deceleration of the drive. | |
| 22.01 | ACC/DEC 1/2 SEL | | |

| Index | Parameter name / value | Description | FbEq |
|---|---|---|---|
| | PAR 22.08&09 | Acceleration and deceleration times given by parameters 22.08 and 22.09 | 15 |
| 22.08 | ACC PTR | Selects the source for 22.01 | 100 = 1 s |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 22.09 | DEC PTR | Selects the source for 22.01 | 100 = 1 s |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 26 | MOTOR CONTROL | Parameters through which the Adaptive Program can control the flux of the drive. | |
| 26.06 | FLUX REF PTR | Selects the source for the flux reference. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 40 | PID CONTROL | Parameters through which the Adaptive Program can affect on the process PID control. | |
| 40.07 | ACTUAL1 INPUT SEL | | |
| | PARAM 40.25 | Source selected by parameter 40.25. | 6 |
| 40.25 | ACTUAL1 PTR | Selects the source for 40.07 | 100 = 1% |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 83 | ADAPT PROG CNTRL | Execution control of the Adaptive Program. | |
| 83.01 | ADAPT PROG CMD | Selects the operation mode for the Adaptive Program. | |
| | STOP | Stop. The program cannot be edited. | |
| | START | Run. The program cannot be edited. | |
| | EDIT | Stop to edit mode. The program can be edited. | |
| 83.02 | EDIT COMMAND | This parameter is not yet in use. Selects the command for the block placed in the location defined by parameter 83.03. The program must be in edit mode. (See parameter 83.01.) | |
| | NO | Home value. The value automatically restores to NO after an editing command has been executed. | |
| | PUSH | Shifts the block in the location defined by parameter 83.03 and the subsequent blocks one location up. A new block can be placed in the emptied location by programming the Block Parameter Set as usual.<br>**Example:** A new block needs to be placed in between the current block number four (parameters 84.20 … 84.25) and five (parameters 84.25 … 84.29).<br>In order to do this:<br>- Shift the program to the edit mode by parameter 83.01.<br>- Select location number five as the desired location for the new block by parameter 83.03.<br>- Shift the block in location number 5 and all subsequent blocks one location forward by parameter 83.02 (selection PUSH).<br>- Program the emptied location number 5 by parameters 84.25 to 84.29 as usual. | |

<table>
<tr><th>Index</th><th>Parameter name / value</th><th>Description</th><th>FbEq</th></tr>
<tr><td></td><td>DELETE</td><td>Deletes the block in the location defined by parameter 83.03 and shifts the subsequent blocks one step down.</td><td></td></tr>
<tr><td>83.03</td><td>EDIT BLOCK</td><td>This parameter has not been implemented yet. Defines the block location number for the command selected by parameter 83.02.</td><td></td></tr>
<tr><td></td><td>1 … 20</td><td>Block location number.</td><td></td></tr>
<tr><td>83.04</td><td>TIMELEVEL SEL</td><td>Selects the execution cycle time for the Adaptive Program. The setting is valid for all blocks.</td><td></td></tr>
<tr><td></td><td>12ms</td><td>12 milliseconds</td><td></td></tr>
<tr><td></td><td>100ms</td><td>100 milliseconds</td><td></td></tr>
<tr><td></td><td>1000ms</td><td>1000 milliseconds</td><td></td></tr>
<tr><td>84</td><td>ADAPTIVE PROGRAM</td><td>Creation and diagnostics of the Adaptive Program.</td><td></td></tr>
<tr><td>84.01</td><td>STATUS</td><td>Shows the value of the Adaptive Program status word. The table below shows the alternative bit states and the corresponding values on the panel display.<br><br><table><tr><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th><th>Display</th><th>Meaning</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>Stopped</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>Running</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>2</td><td>Editing</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>4</td><td>Checking</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>8</td><td>Faulted</td></tr></table></td><td></td></tr>
<tr><td>84.02</td><td>FAULTED PAR</td><td>Points out the faulted parameter in the Adaptive Program.</td><td></td></tr>
<tr><td>84.05</td><td>BLOCK1</td><td>Selects the function block for Block Parameter Set 1.</td><td></td></tr>
<tr><td></td><td>ABS</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>ADD</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>AND</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>COMPARE</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>EVENT</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>FILTER</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>MAX</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>MIN</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>MULDIV</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>NO</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>OR</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>PI</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>PI-BAL</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>SR</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>SWITCH-B</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>SWITCH-I</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>TOFF</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>TON</td><td>See the chapter Function blocks.</td><td></td></tr>
<tr><td></td><td>TRIGG</td><td>See the chapter Function blocks.</td><td></td></tr>
</table>

| Index | Parameter name / value | Description | FbEq |
|---|---|---|---|
| | XOR | See the chapter *Function blocks.* | |
| 84.06 | INPUT1 | Selects the source for input I1 of Block Parameter Set 1 (BPS1). | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value:<br>- Parameter pointer: Inversion, group, index and bit fields. The bit number is effective only for blocks handling boolean inputs.<br>- Constant value: Inversion and constant fields. The inversion field must have value C to enable the setting of the constant.<br>**Example:** The state of digital input DI2 is connected to Input 1 as follows:<br>- Set the source selection parameter (84.06) to +.01.17.01. (The application program stores the state of digital input DI2 to bit 1 of actual signal 01.17.)<br>- Invert the value by switching the sign of the pointer value (-01.17.01.). | |
| 84.07 | INPUT2 | See parameter 84.06. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | See parameter 84.06. | |
| 84.08 | INPUT3 | See parameter 84.06. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | See parameter 84.06. | |
| 84.09 | OUTPUT | Stores and displays the output of Block Parameter Set 1. | |
| … | … | Stores and displays the output of Block Parameter Set 15. | |
| 84.79 | OUTPUT | Stores the output of Block Parameter Set 15. See parameter 84.09. | |
| 85 | USER CONSTANTS | Storage of the Adaptive Program constants and messages. | |
| 85.01 | CONSTANT1 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.02 | CONSTANT2 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.03 | CONSTANT3 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.04 | CONSTANT4 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.05 | CONSTANT5 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.06 | CONSTANT6 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.07 | CONSTANT7 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.08 | CONSTANT8 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.09 | CONSTANT9 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |
| 85.10 | CONSTANT10 | Sets a constant for the Adaptive Program. | |
| | -8388608 to 8388607 | Integer value. | |

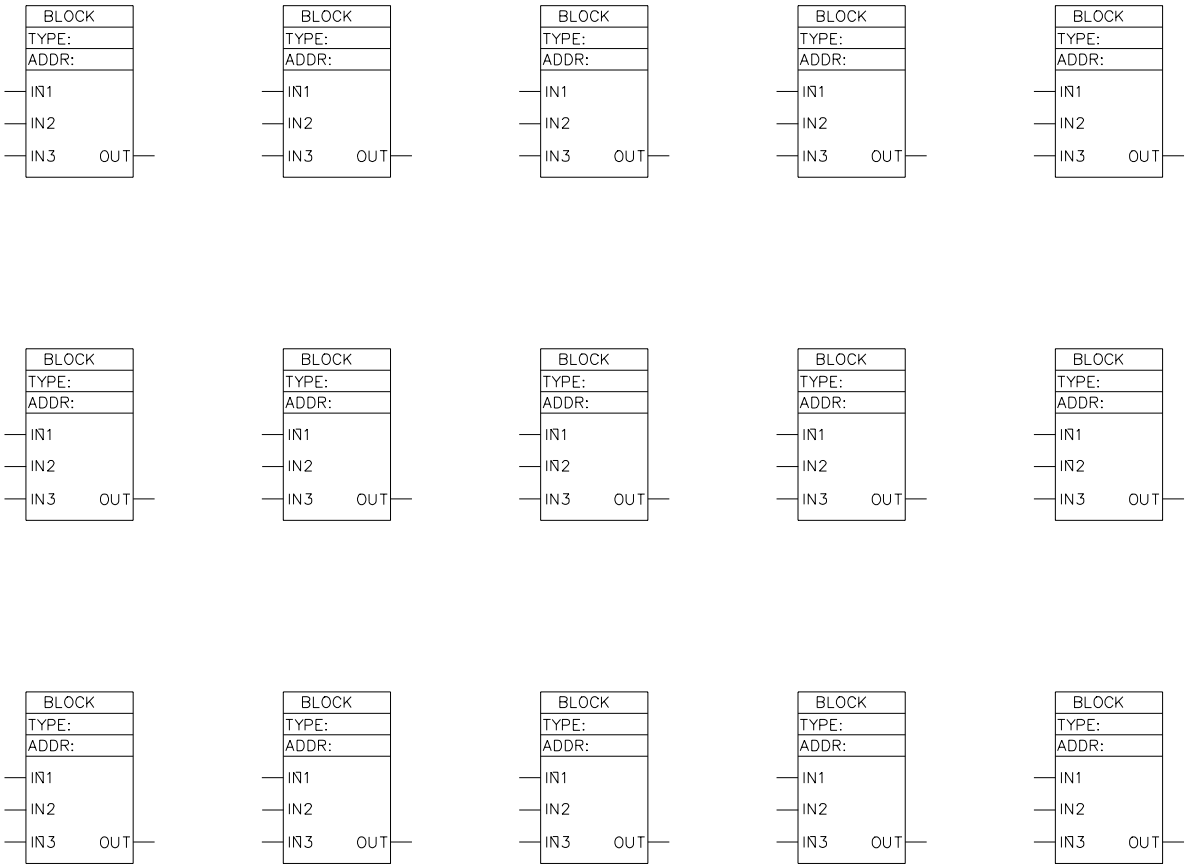
| Index | Parameter name / value | Description | FbEq |
|---|---|---|---|
| 85.11 | STRING1 | Stores a message to be used in the Adaptive Program (EVENT block). | |
| | MESSAGE1 | Message | |
| 85.12 | STRING2 | Stores a message to be used in the Adaptive Program (EVENT block). | |
| | MESSAGE2 | Message | |
| 85.13 | STRING3 | Stores a message to be used in the Adaptive Program (EVENT block). | |
| | MESSAGE3 | Message | |
| 85.14 | STRING4 | Stores a message to be used in the Adaptive Program (EVENT block). | |
| | MESSAGE4 | Message | |
| 85.15 | STRING5 | Stores a message to be used in the Adaptive Program (EVENT block). | |
| | MESSAGE5 | Message | |
| 96 | EXTERNAL AO | Parameters through which the Adaptive Program can control the optional analogue outputs of the drive. | |
| 96.01 | EXT AO1 | | |
| | PARAM 96.11 | Source selected by parameter 96.11. | 16 |
| 96.06 | EXT AO2 | | |
| | PARAM 96.12 | Source selected by parameter 96.11. | 16 |
| 96.11 | EXT AO1 PTR | Selects the source for 96.01. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |
| 96.12 | EXT AO2 PTR | Selects the source for 96.06. | |
| | -255.255.31 … +255.255.31 / C.-32768 … C.32468 | Parameter pointer or constant value. See Parameter 10.04. | |

# Customer diagrams

## Chapter overview

This chapter includes three blank block diagram sheets on which the Adaptive Program can be documented.

| |
|---|
| 85.01 Constant1= |
| 85.02 Constant2= |
| 85.03 Constant3= |
| 85.04 Constant4= |
| 85.05 Constant5= |
| 85.06 Constant6= |
| 85.07 Constant7= |
| 85.08 Constant8= |
| 85.09 Constant9= |
| 85.10 Constant10= |
| 85.11 String1= |
| 85.12 String2= |
| 85.13 String3= |
| 85.14 String4= |
| 85.15 String5= |




| | |
|---|---|
| EXT1 STRT/STP/DIR _ | 10.01 |
| EXT1 START PTR | 10.04 |
| EXT2 STRT/STP/DIR | 10.02 |
| EXT2 START PTR | 10.05 |
| EXT1 REF SELECT | 11.03 |
| EXT1 REF PTR | 11.10 |
| EXT2 REF SELECT | 11.06 |
| EXT2 REF PTR | 11.11 |
| EXT1/EXT2 SELECT | 11.02 |
| EXT 1/2 SEL PTR | 11.09 |
| RO1 | 14.01 |
| RO1 PTR | 14.16 |
| RO2 | 14.02 |
| RO2 PTR | 14.17 |
| RO3 | 14.03 |
| RO3 PTR | 14.18 |
| RO4 | 14.10 |
| RO4 PTR | 14.19 |
| RO5 | 14.11 |
| RO5 PTR | 14.20 |
| RO6 | 14.12 |
| RO6 PTR | 14.21 |
| RO7 | 14.13 |
| RO7 PTR | 14.22 |
| RO8 | 14.14 |
| RO8 PTR | 14.23 |
| RO9 | 14.15 |
| RO9 PTR | 14.24 |
| AO1 | 15.01 |
| AO1 PTR | 15.11 |
| AO2 | 15.06 |
| AO2 PTR | 15.12 |
| RUN ENABLE | 16.01 |
| RUN ENABLE PTR | 16.08 |
| MIN TORQ SEL | 20.13 |
| TORQ MIN PTR | 20.18 |
| MAX TORQ SEL | 20.14 |
| TORQ MAX PTR | 20.19 |
| ACC/DEC | 22.01 |
| ACC PTR | 22.08 |
| DEC PTR | 22.09 |
| FLUX REF SEL | 26.06 |
| FLUX REF PTR | 26.08 |
| ACTUAL1 INPUT SEL | 40.07 |
| ACTUAL 1 PTR | 40.25 |
| EXT AO1 | 96.01 |
| EXT AO1 PTR | 96.11 |
| EXT AO2 | 96.02 |
| EXT AO2 PTR | 96.12 |

| | | |
|---|---|---|
| 83.04 | TIME LEVEL | ms |
| 33.01 | SOFTWARE VERSION | |

ABS ADD AND COMPARE EVENT FILTER MAX MIN MULDIV NO OR PI PI-BAL SR SWITCH-B SWITCH-I TOFF TON TRIGG XOR

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| Based on | Prepared | Title | Doc. des. |
| Customer | Approved | | |
| | Project name | | Resp. dept. |
| Cust. Doc. No. | | ABB Industry Oy | Doc. No. |
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| 85.02 Constant2= |
| 85.03 Constant3= |
| 85.04 Constant4= |
| 85.05 Constant5= |
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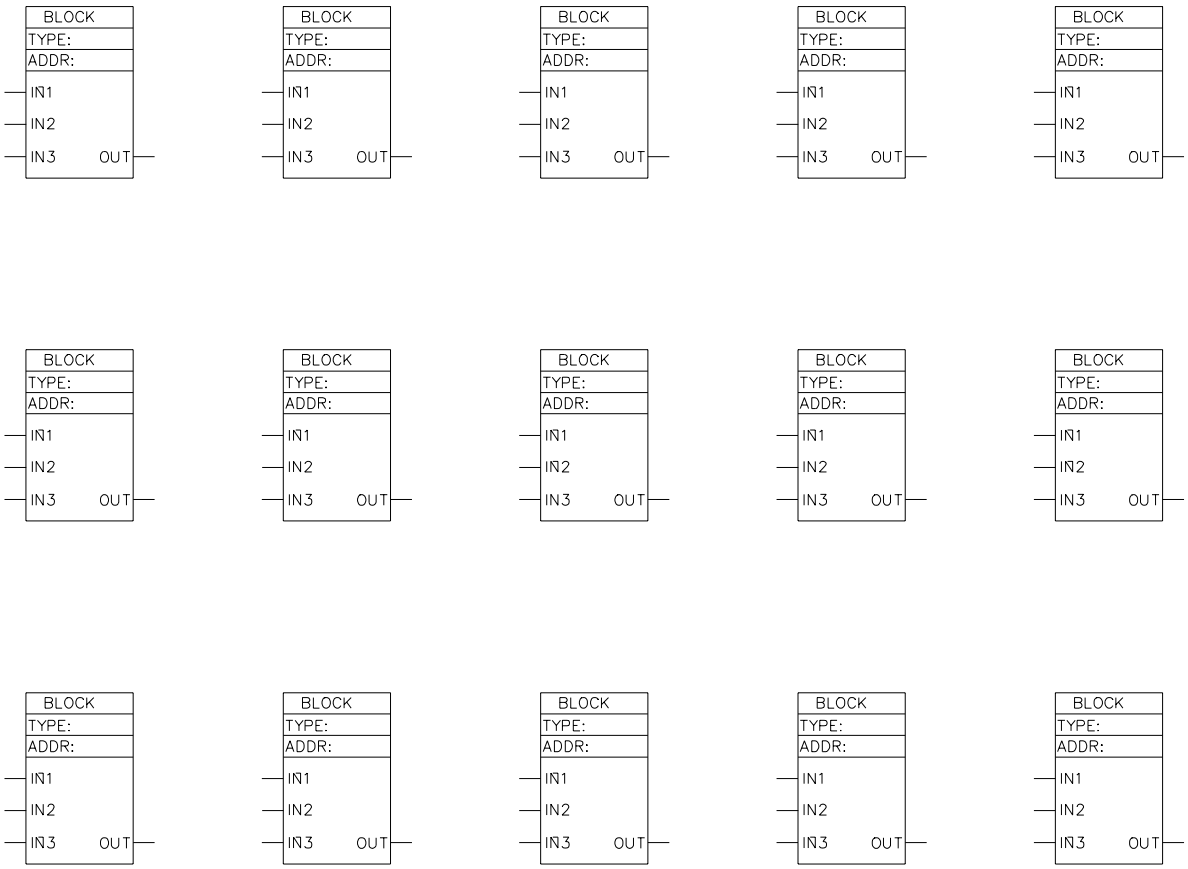
| 85.09 Constant9= |
| 85.10 Constant10= |
| 85.11 String1= |
| 85.12 String2= |
| 85.13 String3= |
| 85.14 String4= |
| 85.15 String5= |




| | |
|---|---|
| EXT1 STRT/STP/DIR | 10.01 |
| EXT1 START PTR | 10.04 |
| EXT2 STRT/STP/DIR | 10.02 |
| EXT2 START PTR | 10.05 |
| EXT1 REF SELECT | 11.03 |
| EXT1 REF PTR | 11.10 |
| EXT2 REF SELECT | 11.06 |
| EXT2 REF PTR | 11.11 |
| EXT1/EXT2 SELECT | 11.02 |
| EXT 1/2 SEL PTR | 11.09 |
| RO1 | 14.01 |
| RO1 PTR | 14.16 |
| RO2 | 14.02 |
| RO2 PTR | 14.17 |
| RO3 | 14.03 |
| RO3 PTR | 14.18 |
| RO4 | 14.10 |
| RO4 PTR | 14.19 |
| RO5 | 14.11 |
| RO5 PTR | 14.20 |
| RO6 | 14.12 |
| RO6 PTR | 14.21 |
| RO7 | 14.13 |
| RO7 PTR | 14.22 |
| RO8 | 14.14 |
| RO8 PTR | 14.23 |
| RO9 | 14.15 |
| RO9 PTR | 14.24 |
| AO1 | 15.01 |
| AO1 PTR | 15.11 |
| AO2 | 15.06 |
| AO2 PTR | 15.12 |
| RUN ENABLE | 16.01 |
| RUN ENABLE PTR | 16.08 |
| MIN TORQ SEL | 20.13 |
| TORQ MIN PTR | 20.18 |
| MAX TORQ SEL | 20.14 |
| TORQ MAX PTR | 20.19 |
| ACC/DEC | 22.01 |
| ACC PTR | 22.08 |
| DEC PTR | 22.09 |
| FLUX REF SEL | 26.06 |
| FLUX REF PTR | 26.08 |
| ACTUAL1 INPUT SEL | 40.07 |
| ACTUAL 1 PTR | 40.25 |
| EXT AO1 | 96.01 |
| EXT AO1 PTR | 96.11 |
| EXT AO2 | 96.02 |
| EXT AO2 PTR | 96.12 |

| | | |
|---|---|---|
| 83.04 | TIME LEVEL | ms |
| 33.01 | SOFTWARE VERSION | |

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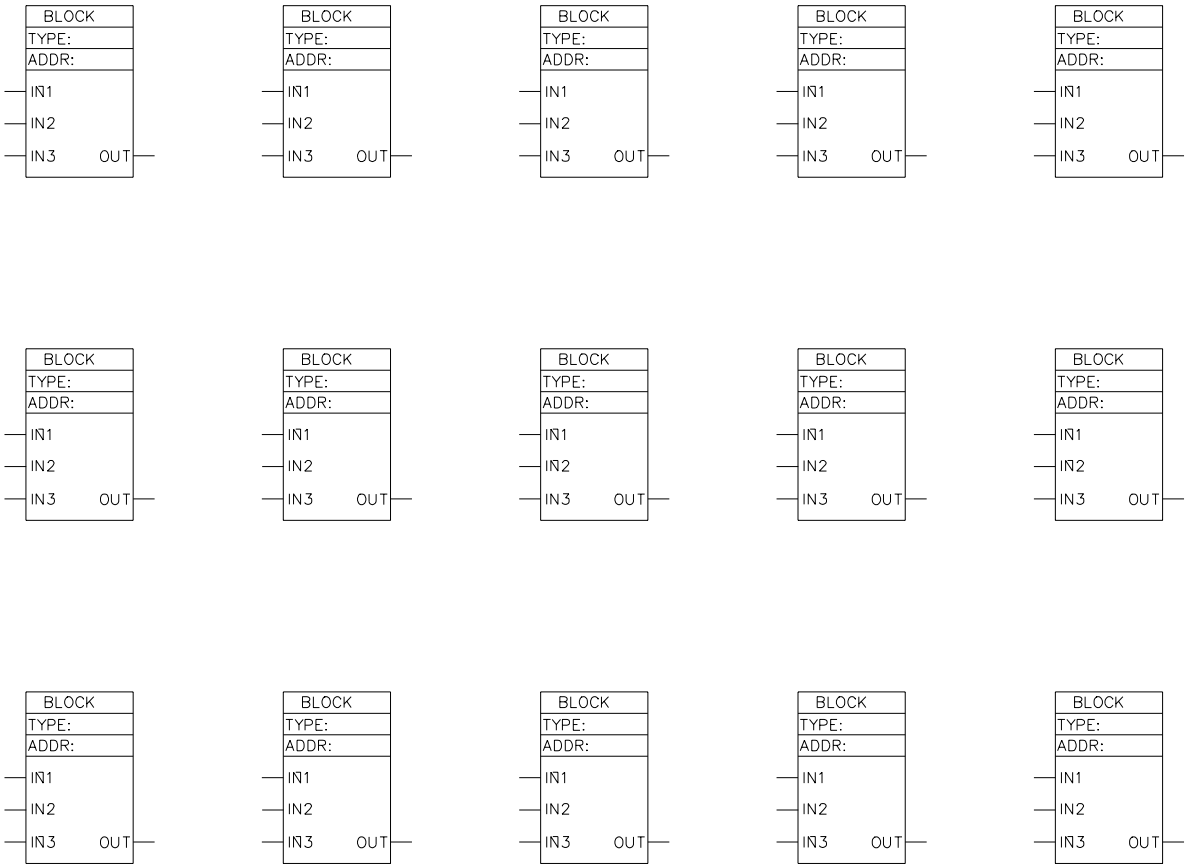


| | |
|---|---|
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| EXT2 STRT/STP/DIR | 10.02 |
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| EXT1 REF PTR | 11.10 |
| EXT2 REF SELECT | 11.06 |
| EXT2 REF PTR | 11.11 |
| EXT1/EXT2 SELECT | 11.02 |
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| RO2 | 14.02 |
| RO2 PTR | 14.17 |
| RO3 | 14.03 |
| RO3 PTR | 14.18 |
| RO4 | 14.10 |
| RO4 PTR | 14.19 |
| RO5 | 14.11 |
| RO5 PTR | 14.20 |
| RO6 | 14.12 |
| RO6 PTR | 14.21 |
| RO7 | 14.13 |
| RO7 PTR | 14.22 |
| RO8 | 14.14 |
| RO8 PTR | 14.23 |
| RO9 | 14.15 |
| RO9 PTR | 14.24 |
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| AO2 | 15.06 |
| AO2 PTR | 15.12 |
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| TORQ MAX PTR | 20.19 |
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| FLUX REF SEL | 26.06 |
| FLUX REF PTR | 26.08 |
| ACTUAL1 INPUT SEL | 40.07 |
| ACTUAL 1 PTR | 40.25 |
| EXT AO1 | 96.01 |
| EXT AO1 PTR | 96.11 |
| EXT AO2 | 96.02 |
| EXT AO2 PTR | 96.12 |

| | | |
|---|---|---|
| 83.04 | TIME LEVEL | ms |
| 33.01 | SOFTWARE VERSION | |

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