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Application Note:

**SJ series type P1 –
PID Sleep Function**

**Please also refer to the
Inverter Instruction Manual**

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Hitachi Industrial Equipment & Solutions America, LLC

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Hitachi SJ series type P1- PID Sleep Function



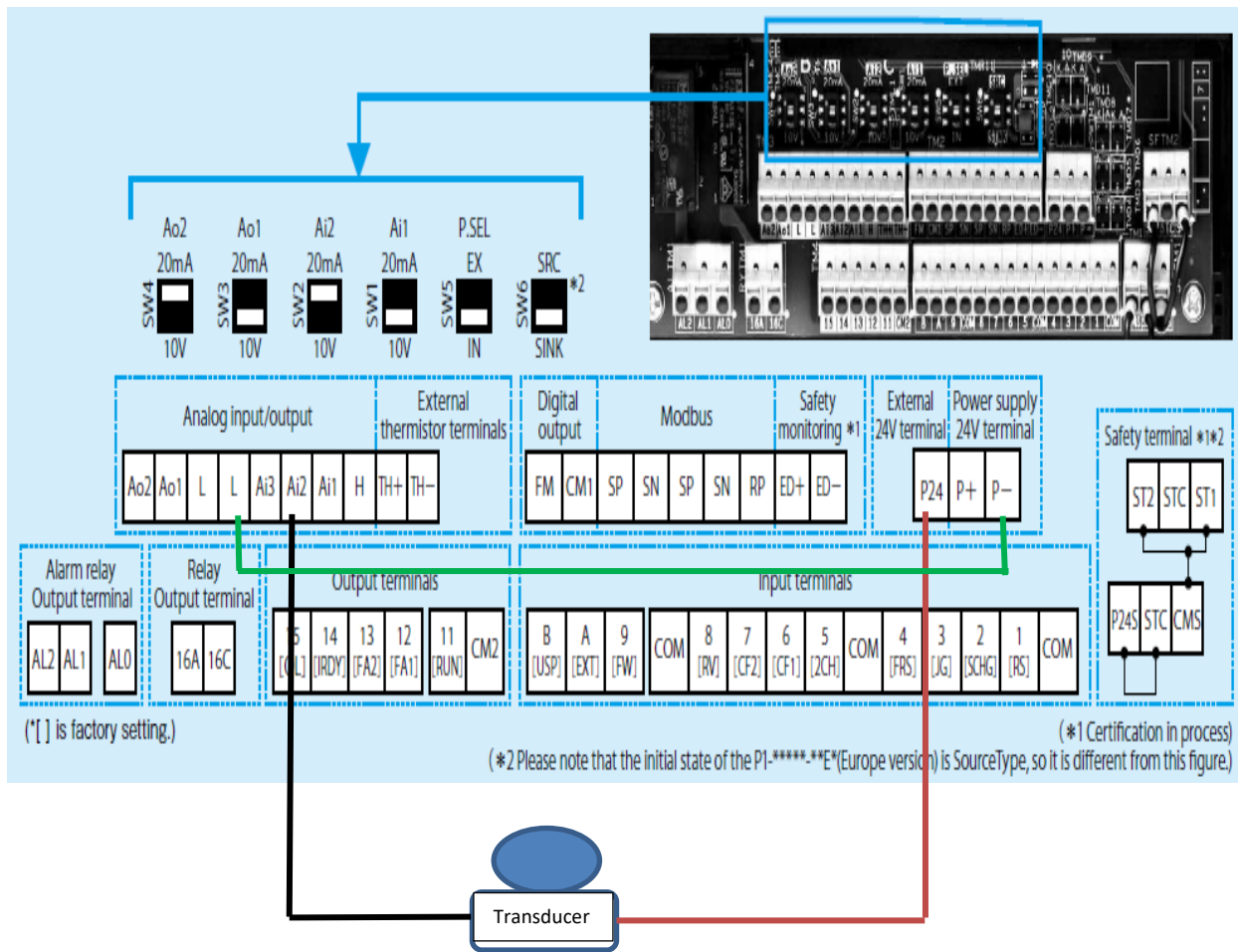
Overview

The SJ series type P1 inverters are equipped with PID controllers that can be used for control of a closed system such as irrigation, pumping, and many other applications. For a complete overview of the PID controllers in the SJ series type P1 inverters please see the “Application Note SJ series type P1- PID Control” located on the Hitachi website.

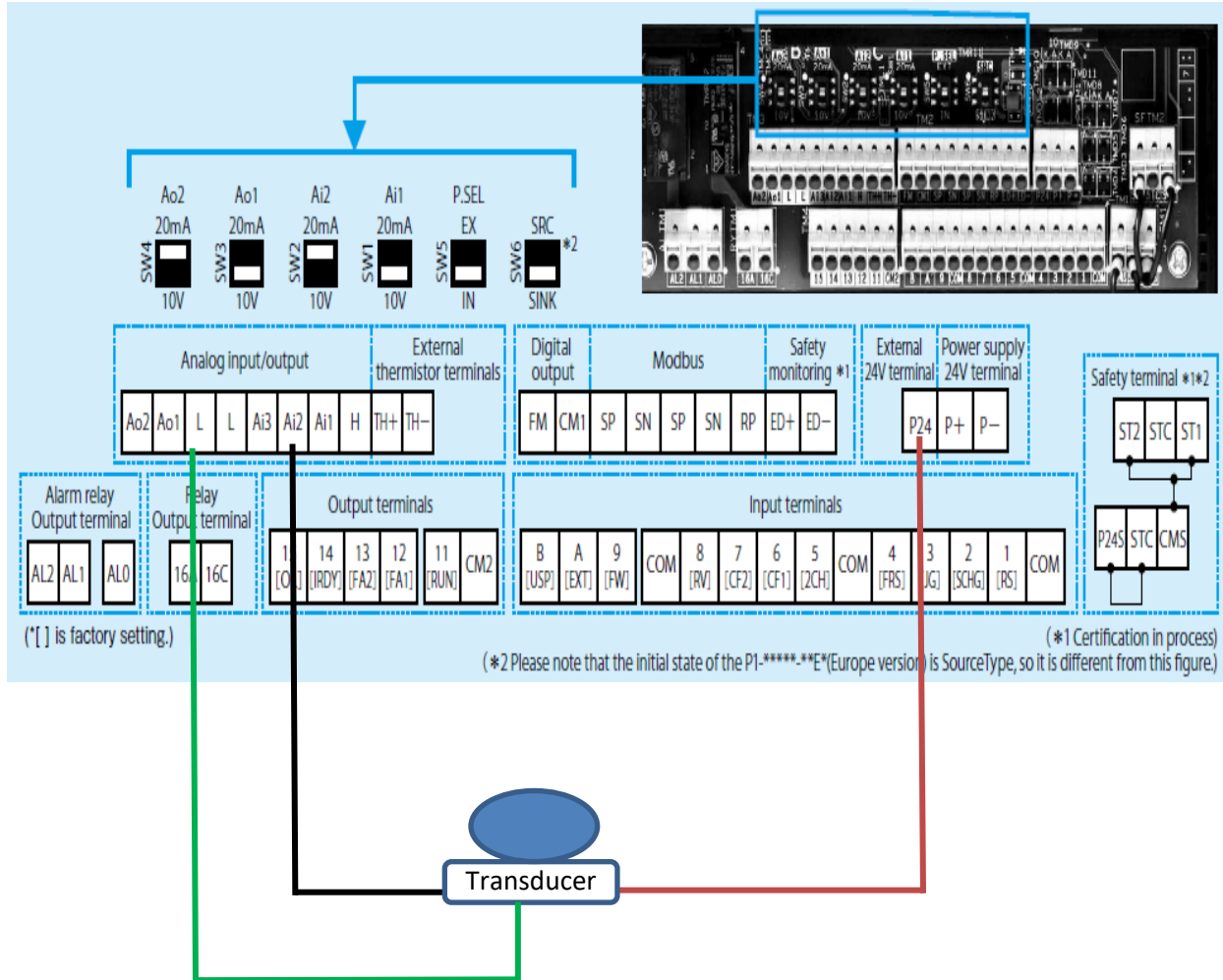
Wiring the SJ series type P1 Inverter for PID Control

The SJ series type P1 inverter has an internal 24Vdc power supply that can be used for transducer excitation.

Terminal P24 is the positive 24Vdc and the analog input can be wired into Ai1, Ai2, or Ai3. Ai1 and Ai2 can be either 0-10Vdc or 0-20mA inputs, configured with the dip switches. Ai3 is -10Vdc to +10Vdc and can be used for frequency command and feedback. Terminal L is the common for the analog inputs. If using a three-wire transducer; wire into the P24, L, and Ai1, Ai2, or Ai3 terminals. If using a two-wire transducer; wire the P24 and Ai1, or Ai2 terminals. You must also connect/wire/jumper the P- terminal with the L terminal. Please see the wiring examples pictured below.



2 -Wire Transducer powered with P1 internal 24Vdc power supply.



3 -Wire Transducer powered with P1 internal 24Vdc power supply.

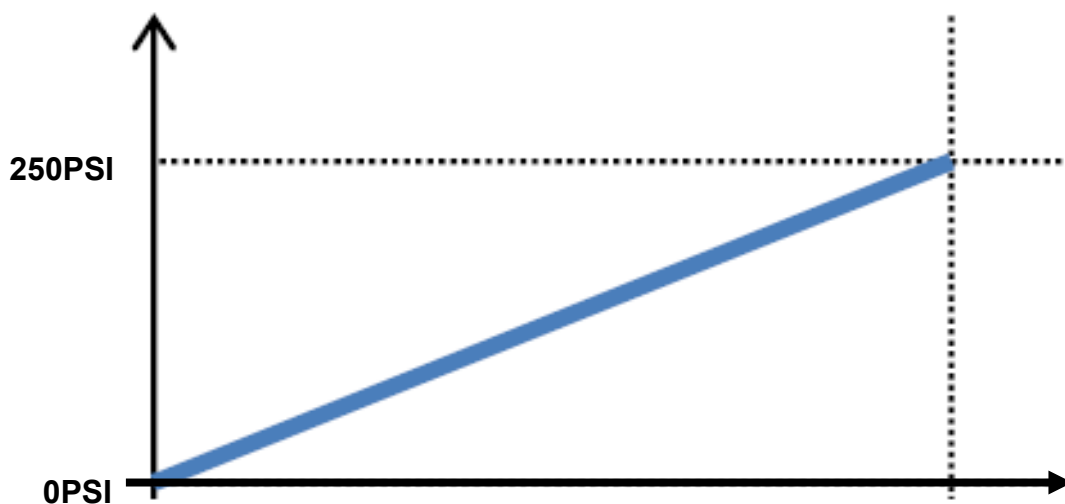
Programming the SJ series type P1 Inverter for PID Control

Please follow the steps below for simple programming of the SJ series type P1 for PID control. For a complete overview of the parameters and programming please see the “Application Note SJ series type P1- PID Control”, located on the Hitachi website.

1. Set parameter **AA101** (Main Speed Source) to function 15 (PID calculation)
2. Set parameter **AH-01** to 01 (enable)
3. Set parameter **AH-03** to the desired engineering units.
4. Set parameter **AH-04** (PID Scale Adjust 0%). In most applications this will be set to 0.
5. Set parameter **AH-05** (PID Scale Adjust 100%). This will be set to the maximum range of your transducer.
6. Set parameter **AH-06** (PID Scale Adjust Point). This will adjust the decimal point for the scale.

Example of PID Scaling:

If the transducer measuring range is 0-250PSI and is wired into Ai1 (0-10Vdc) set AH-04 to 0, set AH-05 to 250, and set AH-06 to 0. For better resolution of the feedback (tenths); you may set AH-04 to 0, and AH-05 to 2500 and set AH-06 to 1.



7. Parameter **AH-07** (PID 1 SV-1 source) should be set to the desired setpoint source. Example: to enter the PID setpoint via the keypad choose option 07 (Keypad).

8. Parameter **AH-10** (PID 1 SV-1) should be set to the desired PID setpoint in actual engineering units (when parameter AH-07 is set to function 07 - Keypad).

9. Parameter **AH-51** (PID1 PV-1 Source) should be set to the desired process variable source (feedback). Example: using a 4-20mA transducer on Ai2, AH-51 will be set to option 2 (Term. Ai2).

10. Set parameter **AA111** to the desired run command source. Example: set to option 2 (Run key on the Keypad).

Programming the SJ series type P1 PID Sleep Function

Please follow the steps below for programming the SJ-P1 PID Sleep Function after the PID function has been enabled.

1. Set parameter **AH-85** (PID Sleep Condition) to the desired PID sleep operation. Function 01 starts sleep operation when the output (frequency) is low. Function 02 starts operation at the rising edge of the SLEP terminal input. Any of the intelligent inputs can be programmed as function 58 to activate the sleep function.
2. Set parameter **AH-86** (PID Sleep Start Level) to the desired frequency for sleep activation, when AH-85 = 01.
3. Set parameter **AH-87** (PID Sleep Time) to the desired stand-by time before putting the inverter into sleep operation. This is in seconds and has a range of 0-100 seconds.
4. Set parameter **AH-91** (Minimum Run Time Before PID Sleep) to allow the output speed to rise above AH-86. This is in seconds and has a range of 0-100 seconds. Please make sure the output has enough time to exceed the setting of AH-86, otherwise the drive will never reach the maximum output.
5. Set parameter **AH-92** (PID Sleep Status Minimum Retaining Time) to retain the sleep status until the time has elapsed. This is in seconds and has a range of 0-100 seconds.
6. Set parameter **AH-93** (PID Wake Trigger Selection) to cancel the sleep function and wake the drive output. Function 01 Cancels the sleep operation when a deviation amount increases in a deceleration direction. Function 02 Cancels the sleep operation when the feedback value decreases. Functions 03 Cancels the operation at the rising edge of the WAKE terminal. The WAKE terminal can be programmed into any of the intelligent inputs by selecting function 59.

7. Parameter **AH-94** (PID Wake Start Level) cancels the sleep operation when the feedback value goes below the set value, when AH-93 is set to function 02.

8. Parameter **AH-95** (PID Wake Operation Time) is the standby time before wake operation is executed when AH-93 is function 02. This is in seconds and has a range of 0-100 seconds.

9. Parameter **AH-96** (PID Wake Start Deviation Amount) cancels the sleep operation when a deviation between the target value and the feedback value increases when AH-93 is function 01.

****Please use the charts on the following pages for the PID Sleep operation.****

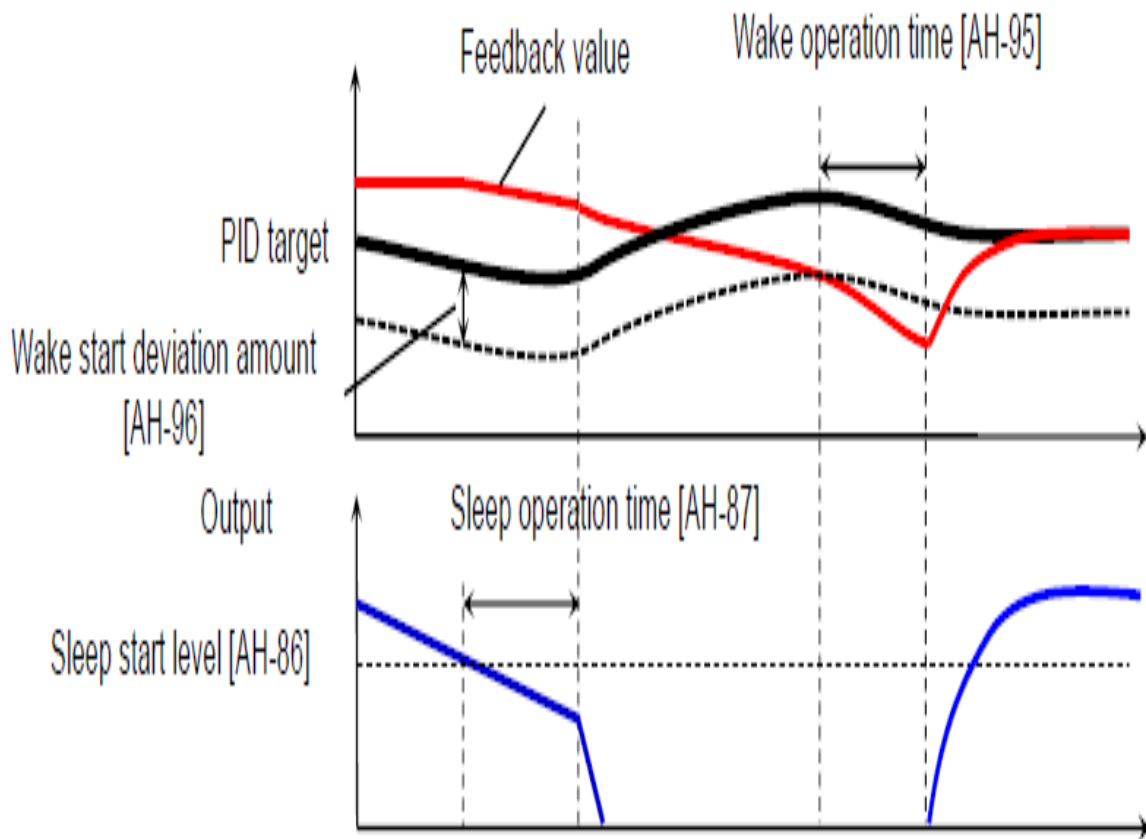
Example 1

AH-85 is set to function 01 (low output)

The sleep operation will start when the output frequency stays below the level of AH-86 continuously for the set time in AH-87.

AH-93 Sleep Cancel (Wake) set to function 01 (deviation amount)

The wake operation will start when PID deviation stays outside AH-96 continuously for the set time in AH-95.



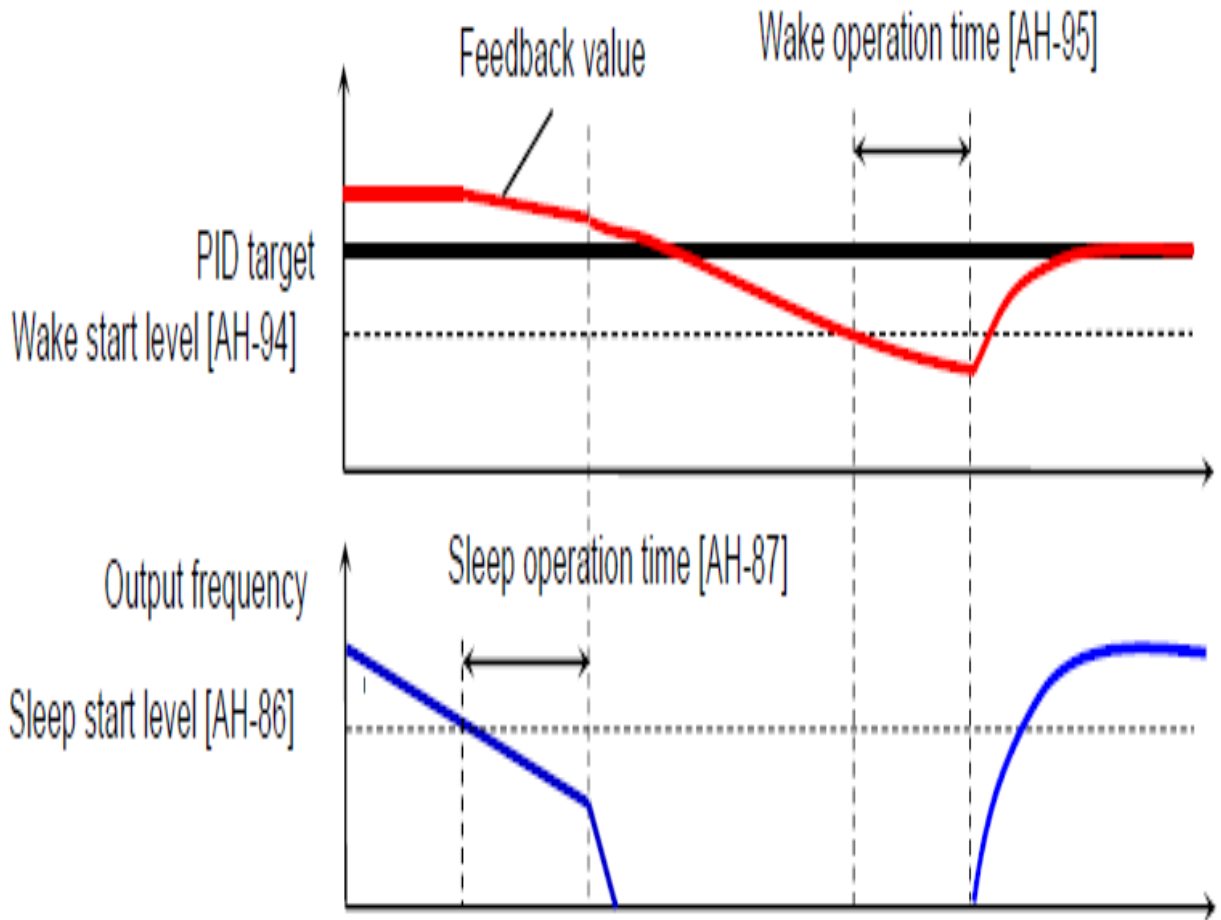
Example 2

AH-85 is set to function 01 (low output)

The sleep operation will start when the output frequency stays below the level of AH-86 continuously for the set time in AH-87.

AH-93 Sleep Cancel (Wake) set to function 02 (low feedback)

The wake operation will start when PID feedback stays below AH-94 continuously for the set time in AH-95.



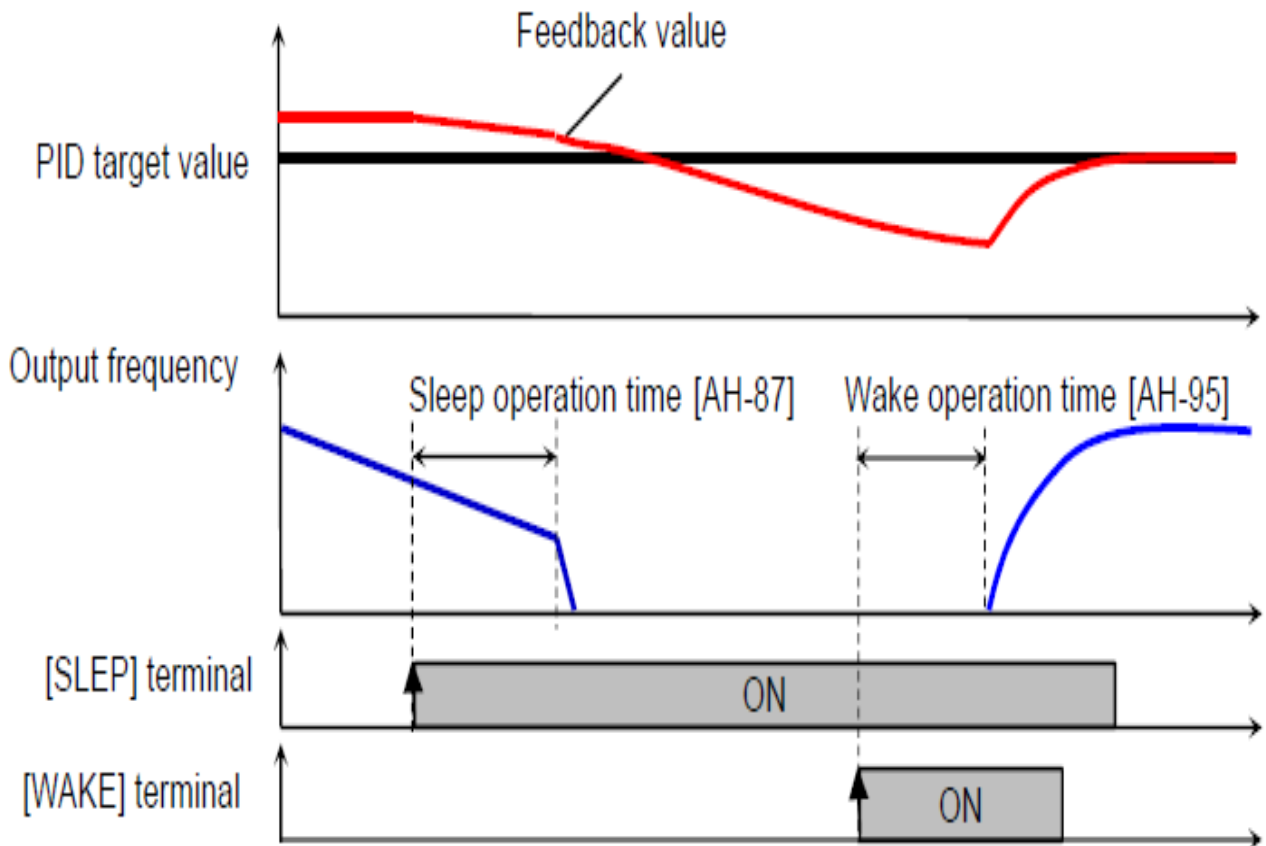
Example 3

AH-85 is set to function 02 (Sleep Terminal)

The sleep operation will start with the rising edge of the sleep terminal, after the elapse of AH-87.

AH-93 Sleep Cancel (Wake Operation) set to function 03 (Wake Terminal)

The wake operation will start after the elapse of AH-95 from the rising edge of the Wake Terminal.



Optional Parameters / Features

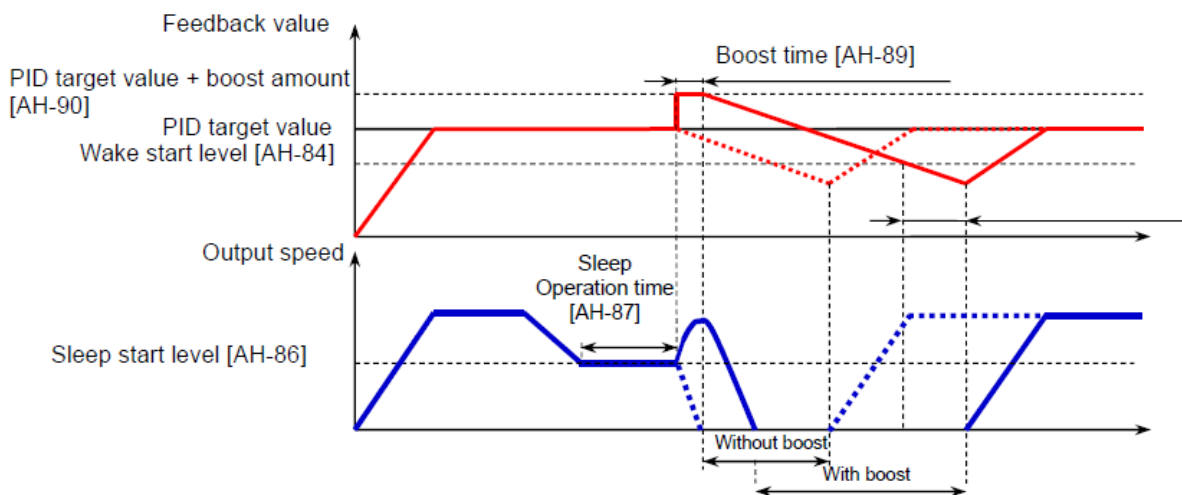
PID Boost Function

The PID Boost function raises the PID target value before sleep and increases the feedback amount once. By using the PID Boost function, the sleep status can be maintained for a longer period. To use the PID Boost function please set the following parameters.

1. Parameter **AH-88** (PID Sleep Boost) set to 01 will boost the target value before going into sleep operation.
2. Parameter **AH-89** (PID Sleep Boost Time) will set the amount of time for boost before going to sleep.
3. Parameter **AH-90** (PID Sleep Boost Amount) will set the amount of boost before going to sleep.

****When AH-85 is set to function 01, the value of AH-90 will be added to the PID target value for the set time of parameter AH-89, if the output frequency stays below AH-86 continuously.****

The diagram below is an example of the sleep boost when AH-85 is set to 01 and AH-93 is set to 02.



Please contact Hitachi Industrial Equipment & Solutions America LLC for questions or concerns with the SJ series type P1 inverters or the PID Sleep Function.

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