ServerU 3rd Generation LAN Bypass Programming Reference Manual

ServerU Inc
2014

Introduction

This document should be read after a whole and comprehensive review of the README file provided together with this document.

Reference version: 1.1.0 / Jun 2014

Global Configuration Command

The commands of the global configuration will let you query the capabilities of your modules such as the number of bypass pairs equipped, which watchdog timers has been enabled, and the maximum level of timer interval for each watchdog timers. The following sections give details about each executable command.

Querying CPLD Major Version

Command: 0x01
Description: Get CPLD major version
Access mode: Read
Returned value:
LSB byte = Command | 0x80
MSB byte = CPLD major version (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37 and Model Name=
./serveru-bpwd-ctl -r -d 0x37 -c 0x01 [enter]
READ ONLY ADDRESS:0x30 Command:0x01 …OK, DATA = 0x0081
Interpretation: The 0x00 byte (MSB byte) of DATA “0x0081” indicates that the version is 0.

Querying CPLD Minor Version

Command: 0x02
Description: Get CPLD minor version
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = CPLD minor version

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x02 [enter]
READ ONLY ADDRESS:0x30 Command:0x02 …OK, DATA = 0x0082
Interpretation: The 0x00 byte (MSB byte) of DATA " 0x0082" indicates that the version is 0.

Querying Module Capability

Command: 0x03
Description: Get module capability (1 means capable whereas 0 means incapable.)
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = return value of module capability (The returned byte consists of
LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

The return value has the following interpretations:

Returned value in hex	Returned value in binary	Interpretation
0x01	00000001b	Capable of
		System-off
		bypass function
0x02	00000010b	Capable of
		Just-on bypass
		function
0x04	00000100b	Capable of
		Run-time
		bypass function
0x08	00001000b	Capable of
		Watchdog1
		bypass function
0x10	00010000b	Capable of
		Watchdog2
		bypass function
0x20	00100000b	Capable of
		Watchdog3
		bypass function

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r –d 0x30 -c 0x03 [enter]
READ ONLY ADDRESS:0x30 Command:0x03 …OK, DATA = 0x**3f**83

Interpretation: The above result shows that all capabilities are enabled in the module.

Querying Bypass Capability (i.e. total number of bypass pairs equipped) in System-off State

Command: 0x04
Description: Get system-off bypass capability

Hex	Binary	Description
0x00	00000000b	Means no bypass equipped
0x01	00000001b	Means 1 pair of bypass equipped
0x03	00000011b	Means 2 pairs of bypass equipped
0x07	00000111b	Means 3 pairs of bypass equipped
0x0f	00001111b	Means 4 pairs of bypass equipped

Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = System-off bypass pairs enabled (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x04 [enter]
READ ONLY ADDRESS:0x30 Command:0x04 …OK, DATA = 0x**0f**84
Interpretation: The above result shows 4 pairs of bypass that can be used in System-off state bypass are equipped.

Querying Bypass Capability (i.e. total number of bypass pairs equipped) in JUST-ON State

Command: 0x05
Description: Get Just-on (Just-on is the brief moment when the internal power supply turns on and booting process starts) bypass capability

Hex	Binary	Description
0x00	00000000b	Means no bypass equipped
0x01	00000001b	Means 1 pair of bypass equipped
0x03	00000011b	Means 2 pairs of

		bypass equipped
0x07	00000111b	Means 3 pairs of
		bypass equipped
0x0f	00001111b	Means 4 pairs of
		bypass equipped

Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = Just-on bypass pairs enabled (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x05 [enter]
READ ONLY ADDRESS:0x30 Command:0x05 …OK, DATA = 0x**0f** 85
Interpretation: The above result shows 4 pairs of bypass that can be used in JUST-ON state are equipped.

Querying Bypass Capability (i.e. total number of bypass pairs equipped) in Run-Time State

Command: 0x06
Description: Get run-time (Just-on is the brief moment when the internal power supply turns on and booting process starts) bypass equipped

Hex	Binary	Description
0x00	00000000b	Means no bypass

		equipped
0x01	00000001b	Means 1 pair of
		bypass equipped
0x03	00000011b	Means 2 pairs of
		bypass equipped
0x07	00000111b	Means 3 pairs of
		bypass equipped
0x0f	00001111b	Means 4 pairs of
		bypass equipped

Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = run-time bypass pairs enabled (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte

is the value returned by the command)

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x06 [enter]
READ ONLY ADDRESS:0x30 Command:0x06 …OK, DATA = 0x**0f** 86
Interpretation: The above result shows 4 pairs of bypass that can be used in run-time state are equipped.

Querying Maximum Level of Timer Interval for Watchdog1 (in run-time state)

Note:

The maximum level of timer interval indicates the maximum value at which the watchdog can start countdown.

Command: 0x07

Description: Get maximum level of timer interval of watchdog1 in run-time state. 0~255 levels (1 level= 1 second)
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = Maximum timer interval for watchdog1 (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x07 [enter]
READ ONLY ADDRESS:0x30 Command:0x07 …OK, DATA = 0x**ff**87
Interpretation: The return value shows the maximum timer interval of watchdog1 is 255 second.

Querying Maximum Level of Timer Interval for Watchdog2 (in run-time state)

Note:

The maximum level of timer interval indicates the maximum value at which the watchdog can start countdown.

Command: 0x08
Description: Get maximum level of timer interval of watchdog2 during run-time.

0~255 levels (1 level= 1 second)
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = Maximum timer interval for watchdog2 (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x08 [enter]
READ ONLY ADDRESS:0x30 Command:0x08 …OK, DATA = 0x**ff**88
Interpretation: The return value shows that the maximum timer interval of watchdog2 is 255 seconds.

Querying Maximum Level of Timer Interval for watchdog3 in Just-on State (Just-on is the brief moment when the internal power supply turns on and booting process starts)

Note:

The maximum level of timer interval indicates the maximum value at which the watchdog can start countdown.

Command: 0x09
Description: Get maximum level of timer interval of watchdog3 in Just-on state(Just-on is the brief moment when the internal power supply turns on and booting process starts) mode. 0~255 scale (**1 scale = *5* seconds**)
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = Maximum timer interval for watchdog3 (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x09 [enter]
READ ONLY ADDRESS:0x30 Command:0x09 …OK, DATA = 0x**ff**89
Interpretation: The return value shows that the maximum timer interval of watchdog3 is 255x5 (1275) seconds.

Setting Modules Back to Factory Default

Command: 0x0A

Byte_data: x (insignificant)

Description: Rest module to the factory default values as shown below:

1. All pairs set of system-off bypass: disable
2. All pairs set of just-on bypass: disable
3. All pairs set of run-time bypass: disable
4. **watchdog1** timer (run-time) stop **watchdog2** timer(run-time) stop **watchdog3** timer(JUST-ON) stop.
5. **watchdog1** (run-time) timer interval=0 (value which can be accessed in read/write mode by 0x22 command, refer to 4.4.3 Querying and Setting Watchdog1 Timer).

   watchdog2 (run-time) timer interval=0(value which can be accessed in read/write mode by 0x32 command, refer to 4.5.3 Querying and Setting Watchdog2 Timer)

   watchdog3 (JUST- ON) timer interval=0 (value which can be accessed in read/write mode by 0x42 command, refer to 4.6.3 Querying and Setting Watchdog3 Timer).

Access mode: Write

<example> In this example, let I2C address=0x37FW-9655
./serveru-bpwd-ctl -w -d 0x37 -c 0x0A -o 0x00 [enter] (enter any value between 0x00 and 0xff, it is not significant)
WRITE ADDRESS:0x30 Command:0x0A DATA:0x00…OK

Note:

The 0x0A command will only reset the settings back to its factory defaults ; it will not rewrite the settings to the flash. In order to save the current running configurations to the flash permanently, always use the 0x0B command.

Saving Current Settings to Flash

Command: 0x0B

Byte_data: x (insignificant)

Description: Save current value to NVRAM including the following settings:

1. 1. System-off bypass setting (the current running value in RAM will be saved)
1. 2. Just-on (Just-on is the brief moment when the internal power supply turns on and booting process starts) bypass setting (the current running value in RAM will be saved)
2. 3. Setting of bypass status to be either enable or disable when watchdog1 (run-time) expires (the current running value in RAM will be saved)
1. 4. Setting of bypass status to be either enable or disable when watchdog2

(run-time) expires (the current running value in RAM will be saved)

1. 5. Setting of bypass status to be either enable or disable when watchdog3 JUST-ON expires (the current running value in RAM will be saved)
1. 6. Setting of Watchdog1 (run-time) timer interval (the current running value in RAM will be saved)
1. 7. Setting Watchdog2 (run-time) timer interval (the current running value in RAM will be saved)
2. 8. Setting Watchdog3 Just-on (Just-on is the brief moment when the internal power supply turns on and booting process starts) timer interval (the current running value in RAM will be saved)

Access mode: Write

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x0B -o 0xff [enter](enter any value between 0x00 and 0xff, it is not significant)
WRITE ADDRESS:0x30 Command:0x0B DATA:0x00…OK

Caution:

There is a limitation of 10,000 writes to the NVRAM via the 0x0B command.

Querying Board ID

To get board id, you need to do 1 time [Write] and then 3 times of [Read] command consecutively to get full board ID.

Command: 0x0C
Byte_data: x (insignificant)
Description: write this command to get board ID from CPLD
After executing this command, you must execute Read command below for
Board ID 3 times consecutively.
Access Mode: Write

Command: 0x0C
Description: Read Board ID (MAC address). When reading Board ID, you need to execute this command to communicate with the register (execution instruction) three times to get full Board ID. Before reading the Board ID, make sure you write first by using the command in write mode (see above).
Return Value:
MSB byte = 0xXXXX (XXXX means Board ID)
Access Mode: Read

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x0C -o 0x00 [enter] (enter any value between 0x00 and 0xff, it is not significant)
WRITE ADDRESS:0x30 Command:0x0C DATA:0x00…OK
./serveru-bpwd-ctl -r -d 0x37 -c 0x0C [enter]
READ ONLY ADDRESS:0x30 Command:0x0C …OK, DATA = 0x***90 00***
./serveru-bpwd-ctl -r -d 0x37 -c 0x0C [enter]
READ ONLY ADDRESS:0x30 Command:0x0C …OK, DATA = 0x***1a 0b***
./serveru-bpwd-ctl -r -d 0x37 -c 0x0C [enter]
READ ONLY ADDRESS:0x30 Command:0x0C …OK, DATA = 0x***ee 72***
Interpretation: It indicates that Board ID is 00 90 0b 1a 72 ee.

Enabling just-on bypass forcefully by simulating just-on instance

This command will forcefully enable the bypass pair during just-on by simulating the just-on instance.

This command is provided as a means to let system which restarts by software without complete shutdown procedures to force to enable just-on bypass by simulating just-on instance (Soft reboot is restarting a computer under software control without shutdown or triggering a reset line). This command will also force to enable the setting in watchdog3. For more information, see 4.3.2 Querying and Setting Bypass Status in Just-on State (Just-on is the brief moment when the internal power supply turns on and booting process starts) and 4.6 Bypass Setting with Timer Control of Watchdog3 (in just-on state).

Command: 0x0F
Description: Get Just-on (Just-on is the brief moment when the internal power supply turns on and booting process starts) bypass status in either enable or disable.
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = Bypass pairs that are forced to enable during Just-on
(The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command) , and the meaning of return value is listed as _**Table 1**.

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x0f [Enter]

READ ADDRESS:0x30 Command:0x0f …OK, DATA = 0x**03**8f

Interpretation: The above returned value means that pair 1 and pair 2 will be set to enable just-on bypass forcefully.

Command: 0x0f
Byte_data: 0x00~0x0f
Description: Force to enable or disable the just-on bypass by simulating just-on instance. Bit 0~7 indicate to force to enable or disable just-on bypass for that pair; 1 means to enable whereas 0 means to disable.
Access mode: Write

<**example**>In this example, let I2C address=0x37 and Model Name=

./serveru-bpwd-ctl -w -d 0x37 -c 0x0f -o 0x03 [Enter]

WRITE ADDRESS:0x30 Command:0x03 Data:0x03…OK

Explanation: The above command will force to enable bypass pair 1 and 2 as well as just-on *watchdog timer 3* during just-on instance.

Note:

The 0x0f command will enable the bypass settings specified here as well as the settings specified by Watchdog 3 command set (0x41, 0x42). When both 0x11 and 0x0f commands are used, the later issued command will take precedence in system reset condition.

For example a system with the following settings:

1. Using 0x41

./serveru-bpwd-ctl -w -d 0x37 -c 0x41 -o 0x**04** [enter] 2.

Using 0x42

./serveru-bpwd-ctl -w -d 0x37 -c 0x42 -o 0x**01** [enter] 3.

Using 0x11:

./serveru-bpwd-ctl -w -d 0x37 -c 0x11 -o 0x**01** [enter]

4. Using 0x0f:

./serveru-bpwd-ctl -w -d 0x37 -c 0x0f -o 0x**02** [enter]

Vs.

1. Using 0x41

./serveru-bpwd-ctl -w -d 0x37 -c 0x41 -o 0x**04** [enter]

2. Using 0x42

./serveru-bpwd-ctl -w -d 0x37 -c 0x42 -o 0x**01** [enter] 3.

Using 0x0f:

./serveru-bpwd-ctl -w -d 0x37 -c 0x0f -o 0x**02** [enter]

4. Using 0x11:

./serveru-bpwd-ctl -w -d 0x37 -c 0x11 -o 0x**01** [enter]

The system will behave like this:

Condition
Result
System Reset
When the
Over 5 seconds:
or restart from a
system
Pair 3 bypass is
complete
powers on:
enabled
shutdown
Pair 2 bypass
is enabled
Soft Reboot
When the
Over 5 seconds:
system
Pair 3 bypass is
powers on:
enabled
Pair 2 bypass
is enabled

VS.

Condition
Result
System Reset
When the
Over 5 seconds:
or restart from
system
Pair 3 bypass is
a complete
powers on:
enabled
shutdown
Pair 1 bypass
is enabled
Soft Reboot
When the
Over 5 seconds:
system
Pair 3 bypass is
powers on:
enabled
Pair 2 bypass
is enabled

Bypass setting

The commands of bypass setting will let you query and configure the number of bypass pairs in each of the 3 instances, namely, System-off, Run-time, and Just-on (Just-on is the brief moment when the internal power supply turns on and booting process starts).

Querying and Setting Bypass Status in System-off State

Note:

System-off is the state in which the system is powered off.

Command: 0x10

Description: Get system-off bypass status in either enable or disable. Bit 0~7 indicate that system-off bypass is enabled or disabled for that pair; 1 means enabled and 0 means disabled.
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = System-off bypass status (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command). You can get bypass pairs setting by command 0x10 in system-off state, and the meaning of return value is listed as **Table 1**.

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x10 [enter]
READ ONLY ADDRESS:0x30 Command:0x10 …OK, DATA = 0x**0f**90
Interpretation: The above result shows pairs 1, 2, 3 and 4 of bypass are enabled.

Command: 0x10
Byte_data: 0x00~0x0f
Description: Set to enable or disable the system-off bypass. Bit 0~7 indicate to disable or enable system-off bypass for each pair; 1 means to enable whereas 0 means to disable.
Access mode: Write

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x10 -o 0x0f [enter]
WRITE ADDRESS:0x30 Command:0x10 DATA:0x**0f**…OK
Explanation: The above command demonstrates to enable pairs 1, 2, 3 and 4 of LAN bypass.

Querying and Setting Bypass Status in Just-on State (Just-on is the brief moment when the internal power supply turns on and booting process starts)

Just-on (Just-on is the brief moment when the internal power supply turns on and booting process starts) is the state in which the system is just powering on and CPU starts to run BIOS code until an OS is fully loaded.

Note:

1. 1. Soft reboot, i.e, restarting a computer under software control without shutdown or triggering a reset line, will not activate the bypass settings in JUST-ON. Instead, it will carry on the bypass and watchdog status from the preceding run-time instance. Therefore, it is required to perform any shut-down procedure before starting the system in order to go through JUST-ON.
1. 2. The command in this section will only enable just-on bypass which satisfies the above condition; to enable the just-on bypass forcefully, see 4.2.13 Enabling just-on bypass forcefully by simulating just-on instance

Command: 0x11

Description: Get Just-on (Just-on is the brief moment when the internal power supply turns on and booting process starts) bypass status in either enable or disable, Bit 0~7 indicate Just-on (Just-on is the brief moment when the internal power supply turns on and booting process starts) bypass status is enabled or disabled for that pair; 1 means enabled whereas 0 means disabled.
Access mode: Read
Return value: LSB byte = Command | 0x80
MSB byte = Just-on bypass status (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command). You can get bypass pairs setting by command 0x11 in just-on state, and the meaning of return value is listed as **Table 1**.

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x11 [enter]
READ ONLY ADDRESS:0x30 Command:0x11 …OK, DATA = 0x**07** 91
Explanation: The above command shows that pairs 1, 2, and 3 of LAN bypass are enabled.

Command: 0x11
Byte_data: 0x00~0x0f
Description: Set to enable or disable the Just-on (Just-on is the brief

moment when the internal power supply turns on and booting process starts) bypass, Bit 0~7 indicate to enable or disable bypass in Just-on state (Just-on is the brief moment when the internal power supply turns on and booting process starts) for each pair; 1 means to enable whereas 0 means to disable.
Access mode: Write

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -w -d 0x37 -c 0x11 -o 0x**3f** [enter] WRITE ADDRESS:0x30 Command:0x11 DATA:0x03…OK
Explanation: The above command demonstrates to enable pairs 1 to 6 of bypass.

Querying and Setting Bypass Status in Run-Time State

Run-time is the state in which the system is fully up and is running an Operating System. And the system designer can use serveru-bpwd-ctl software to control bypass and watchdog functions during this time.

Command: 0x12
Description: Get run-time bypass status setting in either enabled or disabled,
Bit 0~7 indicate run-time bypass status is enabled or disabled for that pair; 1 means enabled and 0 means disabled.
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = Run-time bypass pairs enabled (The returned byte consists of
LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)
You can get bypass pairs setting by command 0x12 in run-time state, and the meaning of return value is listed as **Table 1**.

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x12 [enter]
READ ONLY ADDRESS:0x30 Command:0x12 …OK, DATA = 0**x00**92
Explanation: The above command shows that none of the bypass pairs are enabled.

Command: 0x12
Byte_data: 0x00~0x0f
Description: Set to enable or disable run-time bypass, Bit 0~7 indicate to enable or disable a run-time bypass for each pair; 1 means to enable whereas 0 means to disable.
Access mode: Write

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -w -d 0x37 -c 0x12 -o 0x00 [enter]
WRITE ADDRESS:0x30 Command:0x12 DATA:0x00…OK
Explanation: The above command demonstrates not to enable any bypass pairs.

Bypass Setting with Timer Control of Watchdog1 (in run-time state)

The commands of watchdog1 timer will let you query the operating status of watchdog1, configure the bypass pairs when it expires, and configure and query the timer interval as well as the time to expiration. This set of commands also offers a method to start and stop the watchdog1 timer.

The bypass function with watchdog1 is meant to provide a means to control the bypass status when system failures occur or requested by software in run-time state. These commands are meant to be embedded in the software which would monitor the system's operating status.

Querying Watchdog1 Running Status

Command: 0x20
Description: Get watchdog1 timer status.
Access mode: Read
Return value: LSB byte = Command | 0x80
MSB byte = 0x00 (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)
The return value has the following interpretation: **0=** watchdog1 timer stopped.
1= watchdog1 timer is running, but not expired yet.
2= watchdog1 timer expired.

<example> In this example, let I2C address=0x37 and Model Name=
./serveru-bpwd-ctl -r -d 0x37 -c 0x20 [enter]
READ ONLY ADDRESS:0x30 Command:0x20 …OK, DATA = 0x**02**A0
Interpretation: The above example shows that watchdog1 is expired.

Setting Bypass Pairs When Watchdog1 Timer Expires

Command: 0x21
Description: Get the bypass pair that will be enabled when watchdog1

timer expires, Bit 0~7: pair bit mask.

Access mode: Read
Return value:
LSB byte =Command | 0x80
MSB byte = bypass pairs enabled (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x21 [enter]
READ ONLY ADDRESS:0x30 Command:0x21 …OK, DATA = 0x0fA1
Interpretation: The result shows that pairs 1, 2, 3, and 4 of bypass will be enabled when watchdog1 expires.

Command: 0x21
Byte_data: <pair bit mask>
Description: Set which bypass pairs will be enabled when watchdog1 timer expires, <pair bit mask> value listed as **Table 1**.

Access mode: Write

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -w -d 0x37 -c 0x21 -o 0x**0f** [enter]
WRITE ADDRESS:0x30 Command:0x21 DATA:0x0f…OK
Interpretation: The example demonstrates to enable bypass pairs 1, 2, 3 and 4 when watchdog1 expires.

Querying and Setting Watchdog1 Timer

Note:

The timer interval indicates the value (in the metrics of level) at which the watchdog will start to count down, i.e. the time elapsed before the timer expires.

Command: 0x22
Description: Get timer setting of watchdog1.
Access mode: Read
Return value:
LSB byte =Command | 0x80
MSB byte = timer setting of watchdog1 (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x22 [enter]
READ ONLY ADDRESS:0x30 Command:0x22 …OK, DATA = 0x**ff**A2
Interpretation: The return value (MSB byte) shows the timer interval of watchdog 1 is 255 which is the value of 0xff in hexadecimal calculation. And it indicates 255 seconds (1 level = 1 second). Note the

LSB=22+80=A0

Command: 0x22
Byte_data: 0x00~0xff
Description: Set timer interval of watchdog1 timer, the data value is 00~ff (1 level = 1 second), range=0~255; 0 means to disable watchdog1 timer.
Access mode: Write

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -w -d 0x37 -c 0x22 -o 0x0f [enter] WRITE ADDRESS:0x30 Command:0x22 DATA:**0x0f**…OK
Explanation: The entered value is 0X0f which equals to 15 in hexadecimal calculation and it indicates 15 seconds.

Querying Time to Expiration of Watchdog1 Timer

Note:

The time to expiration indicates the amount of time (in the metrics of level) left before the watchdog expires.

Command: 0x23
Description: Get the time to expiration on watchdog1 timer, the return value is 0~255 (1 level = 1 second), range=0~255, 0 means disabling watchdog1 timer.
Access mode: Read
Return value:
LSB byte =Command | 0x80
MSB byte = time to expiration of watchdog1 (The returned byte consists of
LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

If the return is 0, it indicates watchdog1 timer is disabled (value obtained from 0x22 is 0), stopped (not counting down actively), or expired (after a successful completion of countdown)

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -r -d 0x37 -c 0x23 [enter]
READ ONLY ADDRESS:0x30 Command:0x23 …OK, DATA = 0x**00**A3
Interpretation: The above result shows that watchdog1 timer is not enabled.

Starting Watchdog1 Timer

Command: 0x24
Byte_data: x (insignificant)
Description: Starting watchdog1 timer. When watchdog1 starts, 4 events will be triggered as listed below:

1. 1. CPLD will stop watchdog3 (in JUST-ON state) upon receiving this command.
2. 2. Reset watchdog1 timer's status to be stopped
3. 3. Reset bypass pair back to be disabled
4. 4. Start to count down

However, watchdog1 will not count down if any of the following situations is true:

- ζ Watchdog1 timer setting = 0 (value obtained from command 0x22).
- ζ The number of bypass pairs = 0 (value obtained from command 0x21).

Access mode: Write

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x24 -o 0x00 [enter] (enter any value between 0x00 and 0xff, it is not significant)
WRITE ADDRESS:0x30 Command:0x24 DATA:0x00…OK

Note:

If the computer turns on from a previous system-off state with a completion of shut-down procedure, the watchdog timer setting will reset to 0. Therefore, it is necessary to set the timer interval first (with the command 0x22) to enable the timer before executing the starting watchdog timer command. On the other hand, if the computer restarts by soft reboot procedure, i.e. restarting a computer under software control without removing power or (directly) triggering a reset line, the watchdog timer setting will remain as the previously set value.

Stopping Watchdog1 Timer in run-time State

Command: 0x25
Byte_data: x (insignificant)
Description: The CPLD will stop watchdog1 used in run-time state and watchdog3 used in Just-on state (Just-on is the brief moment when the internal power supply turns on and booting process starts) upon receiving this command.
Access mode: Write

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x25 -o 0x00 [enter] (enter any value between 0x00 and 0xff, it is not significant)
WRITE ADDRESS:0x30 Command:0x25 DATA:0x00…OK

Bypass Setting with Timer Control of Watchdog2 (in run-time state)

The commands of watchdog2 timer will let you query the operating status of watchdog2, configure the bypass pairs when it expires, and configure and query the timer interval as well as the time to expiration. This set of commands also offers a method to start and stop the watchdog2 timer.

The bypass function with watchdog2 provides a means to control the bypass status when system failures occur or requested by software in run-time state. These commands are meant to be embedded in the software which would monitor the system's operating status.

Querying Watchdog2 Running Status

Command: 0x30
Description: Get watchdog2 timer status.
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = Watchdog2 running status (The returned byte consists of LSB and
MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

The return value has the following interpretations:
0= watchdog2 timer stopped.
1= watchdog2 timer running, but not expired
yet. 2= watchdog2 timer expired.

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x37 [enter]
READ ONLY ADDRESS:0x30 Command:0x30 …OK, DATA = 0x**00**B0
Interpretation: The above result shows that the watchdog2 timer is stopped.

Setting Bypass Pairs when Watchdog2 Expires

Command: 0x31
Description: Get the bypass pair that will be enabled when watchdog2 timer expires, Bit 0~7: pair bit mask:
Access mode: Read

Return value:
LSB byte =Command | 0x80
MSB byte = Bypass pairs that are enabled (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x31 [enter]
READ ONLY ADDRESS:0x30 Command:0x31 …OK, DATA = 0x**0f**B1
Interpretation: The result shows that bypass pairs 1, 2, 3, and 4 will be enabled when watchdog2 expires.

Command: 0x31
Byte_data:<pair bit mask>
Description: Set which bypass pairs will be enabled when watchdog2 timer expires, <pair bit mask> value listed as **Table 1**.

Access mode: Write

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -w -d 0x37 -c 0x31 -o 0x**0f** [enter]
WRITE ADDRESS:0x30 Command:0x31 DATA:0x0f…OK
Explanation: The above example demonstrates to enable bypass pairs 1, 2, 3, and 4 when watchdog 2 expires.

Querying and Setting Watchdog2 Timer

Note:

The timer interval indicates the value (in the metrics of level) at which the watchdog will start to count down, i.e. the time elapsed before the timer expires.

Command: 0x32
Description: Get timer setting of watchdog 2.
Access mode: Read
Return value:
LSB byte =Command | 0x80
MSB byte = Timer settings in seconds (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x37 [enter]
READ ONLY ADDRESS:0x30 Command:0x30 …OK, DATA = 0x**0f**B2

Interpretation: The above result shows the timer interval of watchdog2 is 15 which is the value of 0x0f in hexadecimal calculation. And it indicates 15 seconds (1 level = 1 second).

Command: 0x32
Byte_data: 0x00~0xff
Description: Set the timer interval of watchdog2 timer, the data value is 00~ff
(1 level = 1 second), range=0~255, 0 means to disable watchdog2 timer.
Access mode: Write

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -w -d 0x37 -c 0x37 -o 0x00 [enter]
WRITE ADDRESS:0x30 Command:0x30 DATA:0x00…OK
Explanation: The above example shows to disable the Watchdog2 timer.

Querying Time to Expiration of Watchdog2 Timer

Note:

The time to expiration indicates the amount of time (in the metrics of level) left before the watchdog expires.

Command: 0x33

Description: Get the time to expiration on watchdog2 timer, the return value is 0~255 (1 scale = 1 second), range=0~255, 0 means that watchdog2 timer is disabled.
Access mode: Read
Return value:
LSB byte =Command | 0x80
MSB byte = Time to expiration (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

If the return value=0, it means watchdog2 timer is stopped (not counting down actively), disabled (value obtained from 0x32 is 0), or expired (after successful completion of countdown activity).
<example> In this example, let I2C address=0x37 and Model Name=
./serveru-bpwd-ctl -r -d 0x37 -c 0x33 [enter]
READ ONLY ADDRESS:0x30 Command:0x33 …OK, DATA = 0x**ff**B3
Interpretation: The return value shows that the time to expiration is 255 seconds.

Starting Watchdog2 Timer

Command: 0x34
Byte_data: x (insignificant)
Description: Starting watchdog2 timer. When watchdog2 starts, 4 events will be triggered:

1. 1. CPLD will stop watchdog3 used in Just-on state (Just-on is the brief moment when the internal power supply turns on and booting process starts) upon receiving this command.
2. 2. Reset watchdog2 timer
3. 3. Reset bypass pair (can be set by command 0x31) back to be disabled
4. 4. Start to count down

However, watchdog2 will not count down if any of the following situations is true:

- ζ Watchdog2 timer setting = 0 (value obtained from command 0x32).
- ζ The number of bypass pairs = 0 (value obtained from command 0x31)

Access mode: Write

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x34 -o 0x00 [enter] (enter any value between 0x00 and 0xff, it is not significant)
WRITE ADDRESS:0x30 Command:0x34 DATA:0x00…OK

Note:

If the computer turns on from a previous system-off state with a completion of shut-down procedure, the watchdog timer setting will reset to 0. Therefore, it is necessary to set the timer interval first (with the command 0x32) to enable the timer before executing the starting watchdog timer command. On the other hand, if the computer restarts by soft reboot procedure, i.e. restarting a computer under software control without removing power or (directly) triggering a reset line, the watchdog timer setting will remain as the previously set value.

Stopping Watchdog2 Timer in run-time State

Command: 0x35
Byte_data: x (insignificant)
Description: The CPLD will stop watchdog2 used in run-time state and watchdog3 used in Just-on state (Just-on is the brief moment when the internal power supply turns on and booting process starts) upon receiving this command.
Access mode: Write

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x35 -o 0x00 [enter] (enter any value between 0x00 and 0xff, it is not significant)
WRITE ADDRESS:0x30 Command:0x35 DATA:0x00…OK

Bypass Setting with Timer Control of Watchdog3 (in just-on state)

The commands of watchdog3 timer category will let you query the operating status of watchdog3, configure the bypass pairs when it expires, and configure and query the timer interval as well as the time to expiration. The commands also offer a method to start and stop the watchdog3 timer.

Unlike watchdog1 and watchdog2 which are used to detect system anomalies during run-time, watchdog 3 becomes active since just-on and will start countdown as soon as the system is powered up. These following commands in this section are designed to be embedded in the program which would reset the system when certain conditions are met.

Note:

1. 1. Soft reboot, i.e, restarting a computer under software control without shutdown or triggering a reset line, will not enable the bypass settings in JUST-ON. Instead, it will carry on the bypass and watchdog status from the preceding run-time instance. Therefore, it is required to perform any shut-down procedure before starting the system in order to go through
   JUST-ON state.
1. 2. The command in this section will only enable just-on bypass which satisfies the above condition; to enable the Watchdog3 in just-on state forcefully, see 4.2.13 Enabling just-on bypass forcefully by simulating just-on instance

Querying Watchdog3 Running Status

Command: 0x40
Description: Get watchdog3 timer status.
Access mode: Read
Return value:
LSB byte = Command | 0x80
MSB byte = Watchdog3 running status (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

The return value has the following
interpretations: 0= watchdog3 timer stopped.

1= watchdog3 timer running, but not expired yet.

2= watchdog3 timer expired.

<example> In this example, let I2C address=0x37 and Model Name=
./serveru-bpwd-ctl –r -d 0x37 -c 0x40 [enter]
READ ONLY ADDRESS:0x30 Command:0x40 …OK, DATA = 0x**00**C0
Interpretation: The above result shows that watchdog3 timer has been stopped.

Setting Bypass Pairs when Watchdog3 Expires

Command: 0x41
Description: Get the bypass pairs that will be enabled when watchdog3 timer expires
Access mode: Read
Return value:
LSB byte =Command | 0x80
MSB byte = the bypass pairs enabled (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x41 [enter]
READ ONLY ADDRESS:0x30 Command:0x41 …OK, DATA = 0x**0f**C1
Interpretation: The above result shows that pairs 1, 2, 3, and 4 will be enabled when watchdog3 timer expires.

Command: 0x41
Byte_data: <pair bit mask>
Description: Set which bypass pairs will be enabled when watchdog3 timer expires. The acceptable <pair bit mask> value are listed as **Table 1**.

Access mode: Write

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x41 -o 0x**07** [enter]
WRITE ADDRESS:0x30 Command:0x41 DATA:0x07…OK
Explanation: The above result demonstrates to enable bypass pairs 1, 2, and 3 when watchdog3 timer expires.

Querying and Setting Watchdog3 Timer

Note:

The timer interval indicates the value (in the metrics of level) at which the

watchdog will start to count down, i.e. the time elapsed from the moment the system is powered up until the timer expires.

Command: 0x42
Description: Get timer setting of watchdog 3.
Access mode: Read
Return value:
LSB byte =Command | 0x80
MSB byte = timer setting of watchdog3 (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)

If return value= 0x00, it means that watchdog3 timer is disabled

<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -r -d 0x37 -c 0x42 [enter]
READ ONLY ADDRESS:0x30 Command:0x42 …OK, DATA = 0x**0f** C2
Interpretation: The above result shows that the timer interval of watchdog 3 is 15x5 (75) seconds.

Command: 0x42
Byte_data: 0x00~0xff
Description: Set the timer interval of watchdog3 timer, the data value is 00~ff
(**1 level = 5 seconds**), range=0~255, 0 means to disable watchdog3 timer.
Access mode: Write

<example> In this example, let I2C address=0x37

./serveru-bpwd-ctl -w -d 0x37 -c 0x42 -o 0x**0f** [enter]
WRITE ADDRESS:0x30 Command:0x42 DATA:0x**0f**…OK
Explanation: The above example demonstrates to set the timer interval of watchdog3 to be 15x5 (75) seconds.

Querying Time to Expiration of Watchdog3 Timer

Note:

The time to expiration indicates the amount of time (in the metrics of level) left before watchdog expires.

Command: 0x43
Description: Get the time to expiration of watchdog3 timer, the return value is 0~255 (**1 level = 5 seconds**), range=0~255, 0 means watchdog3 timer is disabled.
Access mode: Read

Return value: LSB byte =Command | 0x80
MSB byte = timer to expiration of watchdog3 timer (The returned byte consists of LSB and MSB byte. The LSB byte signals whether uController responds with the command and it equals to 0x80 plus the value of command; the MSB byte is the value returned by the command)
If return value=0, it means watchdog3 timer is disabled (value obtained from command 0x42), stopped (not counting down actively) or expired (after a successful completion of countdown)

<example> In this example, let I2C address=0x37 and Model Name=
./serveru-bpwd-ctl -r -d 0x37 -c 0x43 [enter]
READ ONLY ADDRESS:0x30 Command:0x43 …OK, DATA = **0x0f**B3
Interpretation: The above result shows that the time to expiration of watchdog3 is 15x5 (75) seconds.

Stopping Watchdog3 Timer

Command: 0x45
Byte_data: x (insignificant)
Description: The CPLD will stop watchdog3 used in Just-on state (Just-on is the brief moment when the internal power supply turns on and booting process starts) upon receiving this command.

Access mode: Write
<example> In this example, let I2C address=0x37
./serveru-bpwd-ctl -w -d 0x37 -c 0x45 -o 0x00 [enter]
(enter any value between 0x00 and 0xff, it is not significant)
WRITE ADDRESS:0x30 Command:0x45 DATA:0x00…OK

Table 1

Hex	Binary	Description
0x00	00000000b	Means none of the bypass
		pairs is enabled
0x01	00000001b	Means bypass pair 1 is
		enabled
0x02	00000010b	Means bypass pair 2 is
		enabled
0x03	00000011b	Means bypass pairs 1 and
		2 are enabled
0x04	00000100b	Means bypass pair 3 is
		enabled
0x05	00000101b	Means bypass pairs 1 and

		3 are enabled
0x06	00000110b	Means bypass pairs 2
		and 3 are enabled
0x07	00000111b	Means bypass pairs 1, 2
		and 3 are enabled
0x08	00001000b	Means bypass pair 4 is
		enabled
0x09	00001001b	Means bypass pairs 1 and
		4 are enabled
0x0a	00001010b	Means bypass pairs 2 and
		4 are enabled
0x0b	00001011b	Means bypass pairs 1, 2
		and 4 are enabled
0x0c	00001100b	Means bypass pairs 3 and
		4 are enabled
0x0d	00001101b	Means bypass pairs 1, 3
		and 4 are enabled
0x0e	00001110b	Means bypass pairs 2, 3
		and 4 are enabled
0x0f	00001111b	Means bypass pairs 1, 2 ,
		3 and 4 are enabled