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## 1. Feature of CPJexc

### Hardware feature

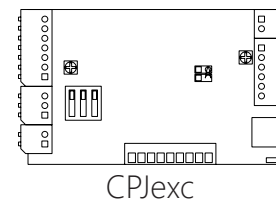
- Converts CAN, IBUS, resistive and digital steering wheel controls into USB HID keyboard and HID remote controller
- Supports both standard CAN and extended CAN
- Resistance range adjustable
- Supported digital steering wheel controls :  
BMW IBUS, AUDI '99-'04 (LIN), VW '99-'04 (LIN), Renault Clio, Renault Scenic MK2 8200107974, Hyundai(digital, Sonata2/3, Marcia, Santamo), Renault SM (digital), Volvo XC70 '03
- Works same as standard USB HID keyboard and HID remote controller by hardware
- 24V tolerant 4 channel resistive(voltage) input
- Supports 28 physical buttons, 52 programmable logical buttons
- Long and Short button for one physical button, up to 5 simultaneous key strokes by one button.
- Supports Cyclic Button
- 6 programmable LED port
- Remote wake-up(resume PC from sleep with steering wheel controls)
- Channel Master/Slave selectable
- Supports J2P BUS peripherals(BSGc, BSGr, CPJ MIX)
- Phone/Mute signal output
- Supports BSGd(Button Signal Generator digital),  
BSGd emulates BMW IBUS, AUDI '99-'04(LIN), VW '99-'04(LIN)
- Remote signal output for CPJ MIX
- SMPS power supplier circuit(Ultra low heat emission)
- Temperature range : -40 ~ +85°C

### Manager feature(for Windows PC)

- Preset switching by buttons.
- Application Launcher(An application launches or pops up with preset switching).
- Voice and OSD by button and preset switching.
- User definable button voice and OSD.
- Rearview by reversing light
- Online firmware update.

- No driver installation needs
- Powered by 12~14V DC(vehicle ACC)
- Available OS : Windows 10, Windows 8, Windows 7, Vista, XP, 2003  
Manager does not support Windows XP, Linux, Mac. But CPJexc works at Linux and Mac after it is configured at Windows.
- Manager does not support Android devices. But CPJexc works at Android devices (Android version 3.1 onwards) after it is configured at Windows.

## 2. Contents



9pin connector x1  
Heat Shrinkable Tube x2  
Short Manual



CAN cable x1



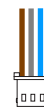
3pin J2P cable x1



7pin cable x1



1CH cable x1



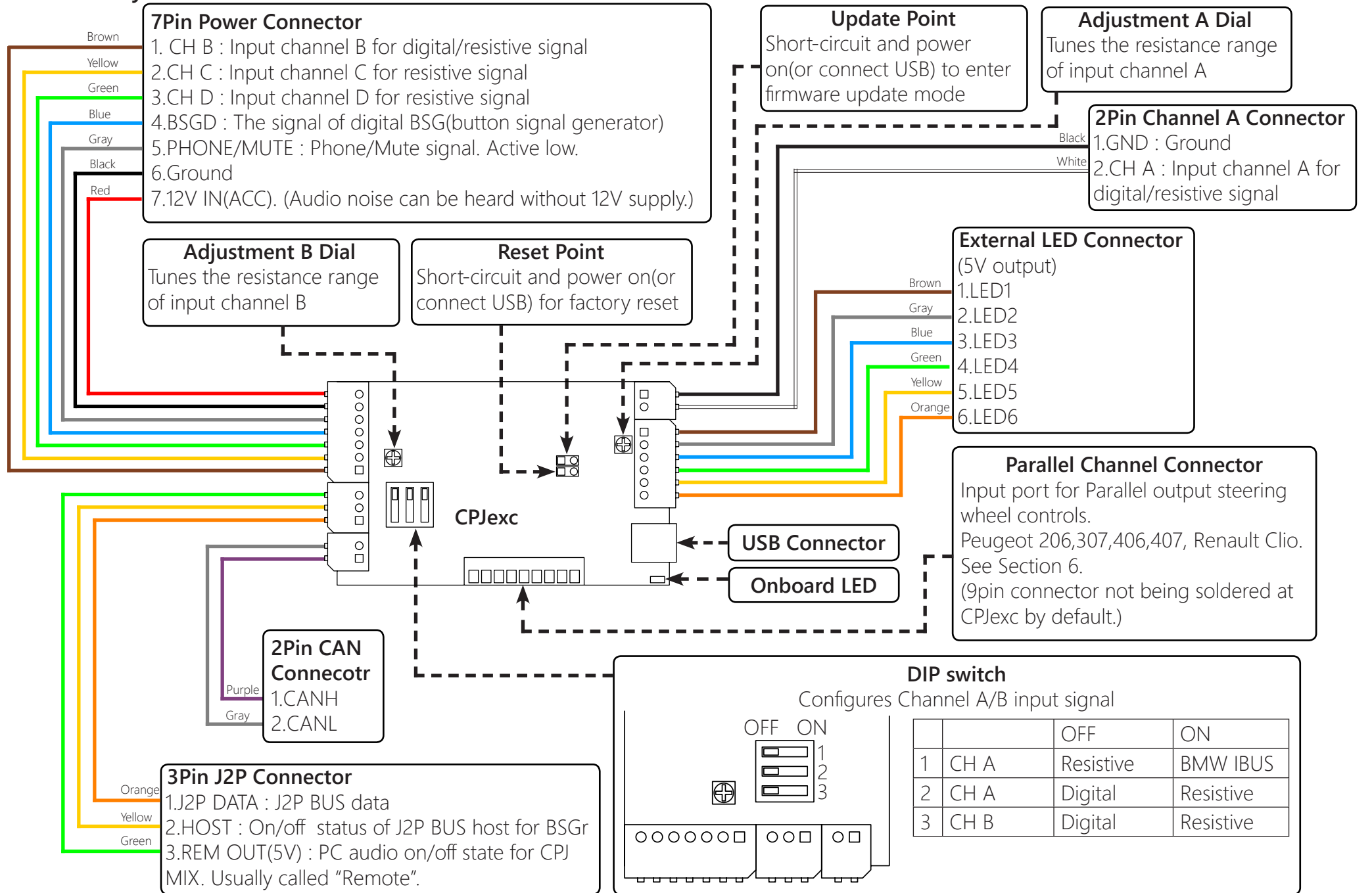
6pin LED cable x1



9pin cable x1

\*USB A-mini B 5P cable and Manager CD is optional.  
You can download Manager(the Configuration Program)  
at [www.exInterface.com](http://www.exInterface.com)

### 3. Board Layout

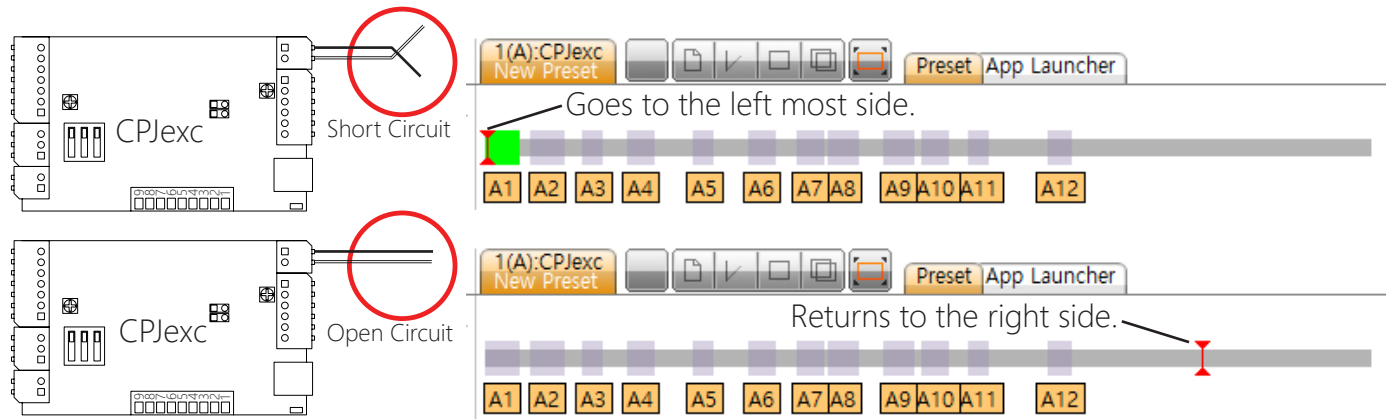


#### 4. Operational Test and Exchange

Configure Channel A(or B) as resistive.(See Section 5-3. Wiring of resistive steering wheel controller)

To check if CPJexc works properly, short-circuit the two wires of a input channel without connecting steering wheel controls. If CPJexc works properly, the red indicator must goes to the left most side by short-circuit, and returns to the right by open-circuit.

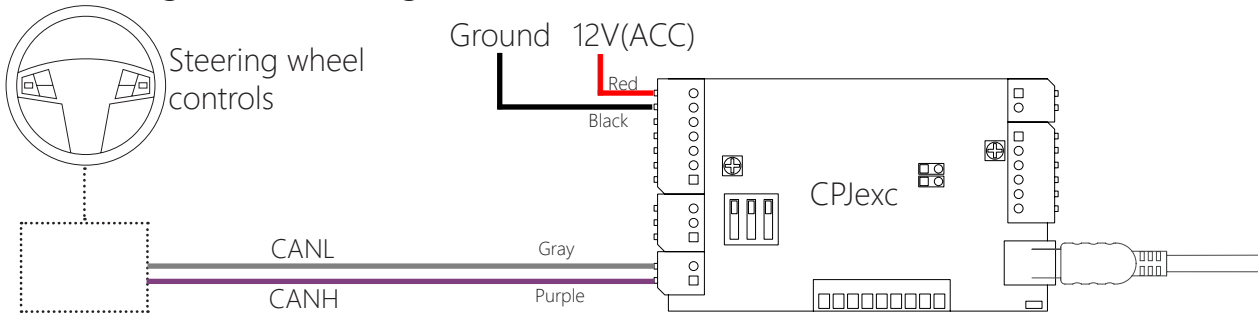
If the red indicator does not move, CPJexc is out of order.



If CPJexc is out of order, please contact your local distributor or [exInterface.com](http://exInterface.com)  
[exInterface.com](http://exInterface.com)([RcJoyCon.com](http://RcJoyCon.com)) provides 1:1 exchange with a new one.

## 5. Wiring

### 5-1. Wiring of CAN steering wheel controls



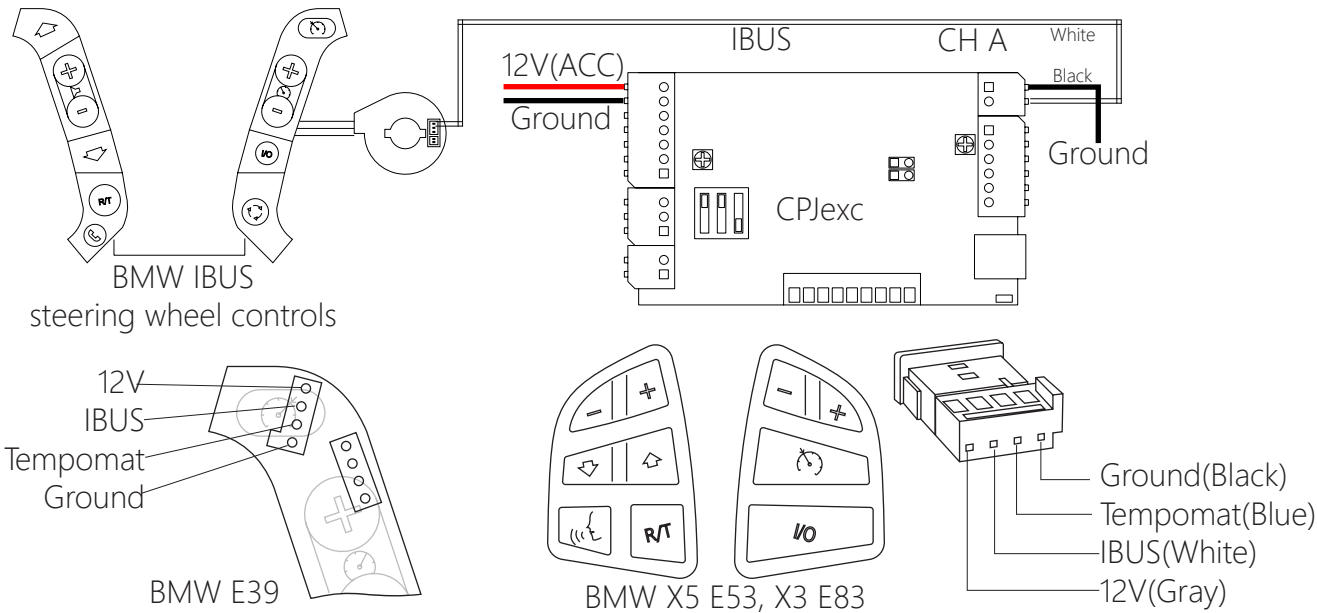
### 5-2. Wiring of BMW IBUS steering wheel controls

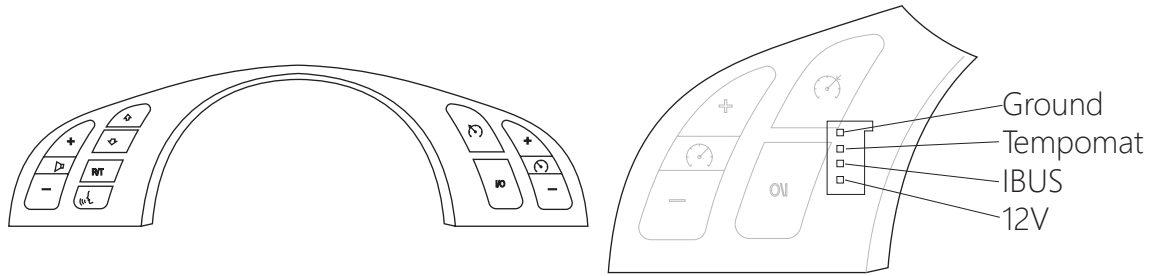
Connect IBUS wire to CH A.

Do not configure IBUS and Tempomat at the same time.

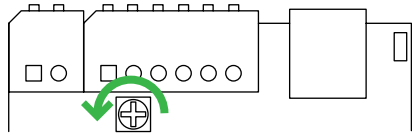
If the channel B is configured as BMW tempomat, IBUS message can be missed because reading tempomat signal takes too long time.

\*12V power(ACC) must be supplied to CPJexc for BMW Tempomat.

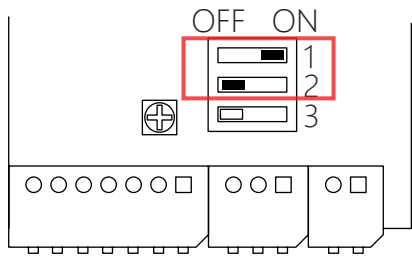




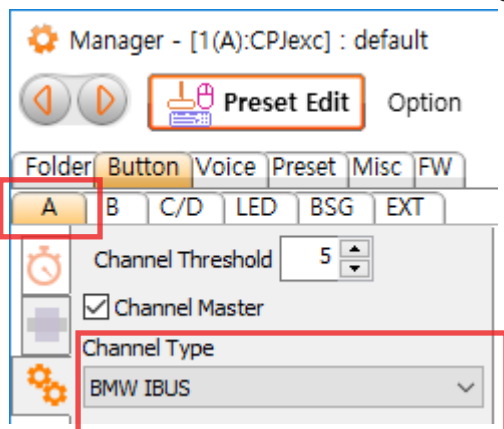
Turn the Adjustment A dial to the end counterclockwise.



Turn on DIP switch 1 and turn off switch 2 for IBUS on Channel A.

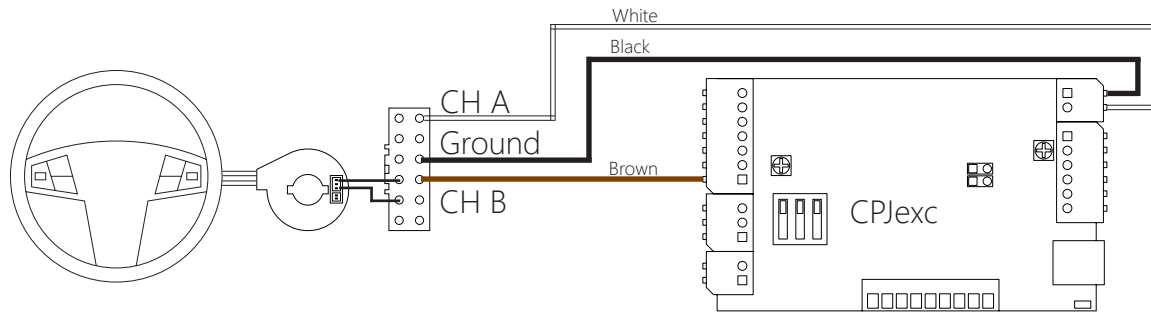


Choose [Button] -> [ A ]-> [Configure], select Channel Type as BMW IBUS.

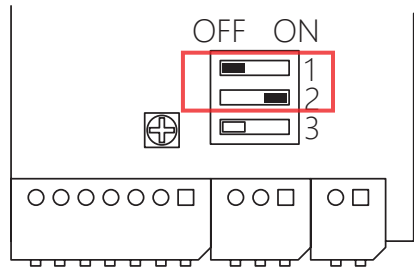


### 5-3. Wiring of resistive steering wheel controller

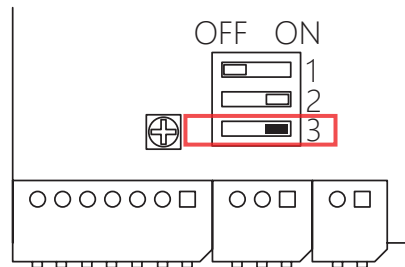
Connect CPJexc's input channel(CH A, CH B, CH C, CH D)wire to the steering wheel control's resistive signal wire.



Warning!! Do not connect signal and Ground wire reversely.

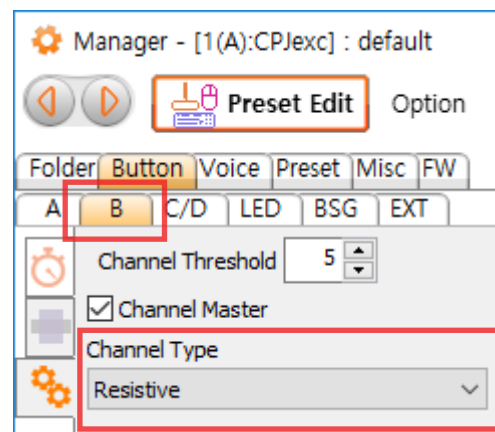
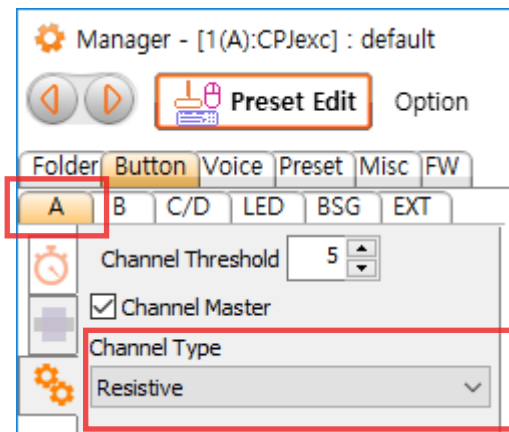


To configure Channel A as resistive, turn off DIP switch 1, turn on DIP switch 2

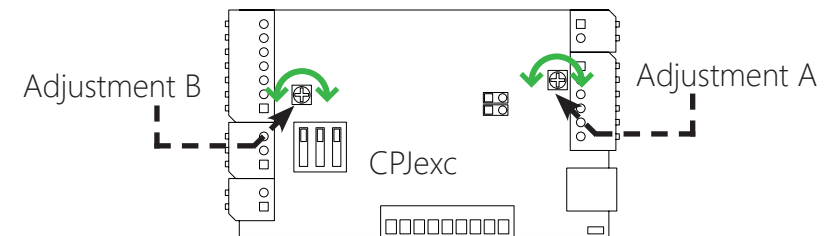


To configure Channel B as resistive, turn on DIP switch 3.

Choose [Button] -> [ A or B ]-> [Configure], select Channel Type as Resistive.



If the buttons in Manager are too close each other, tune the Adjustment A/B on the Board.  
Default position of Adjustment A/B is center.





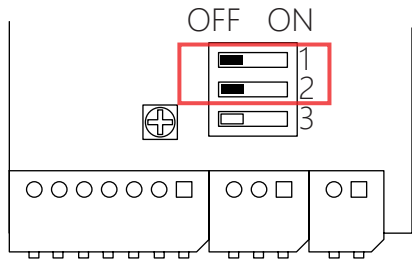
## 5-4. Wiring of digital steering wheel controller

### 5-4-1. AUDI '99-'04(LIN)

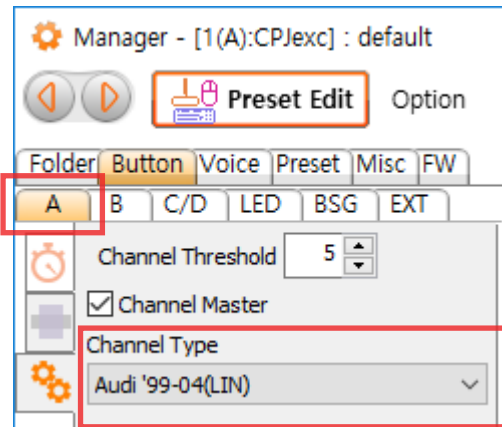
Connect Radio control Data to CH A.



Turn off both DIP switch 1 and 2.

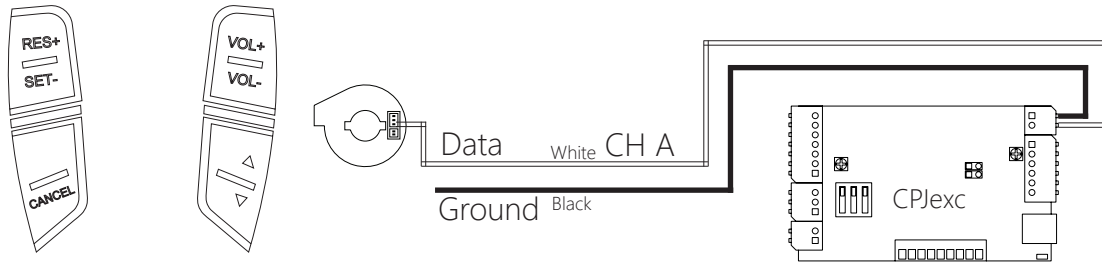


Choose [Button] -> [ A ]-> [Configure],  
select Channel Type as Audi '99-'04(LIN).

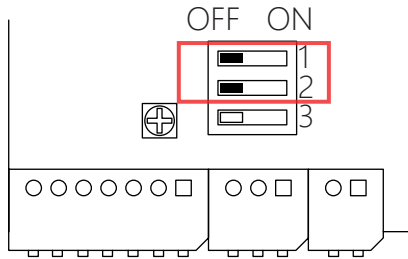


### 5-4-2. VW(Volkswagen) '99-'04 (LIN)

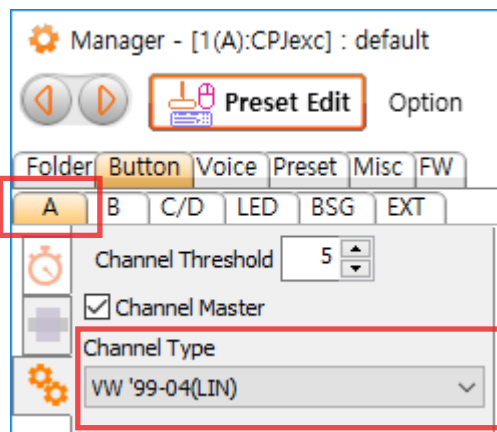
Connect Radio control Data to CH A.



Turn off both DIP switch 1 and 2.



Choose [Button] -> [ A ]-> [Configure], select Channel Type as VW '99-'04.

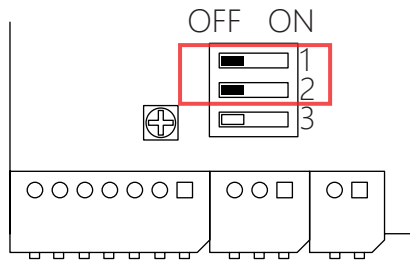


### 5-4-3. Volvo XC70 '03 (LIN)

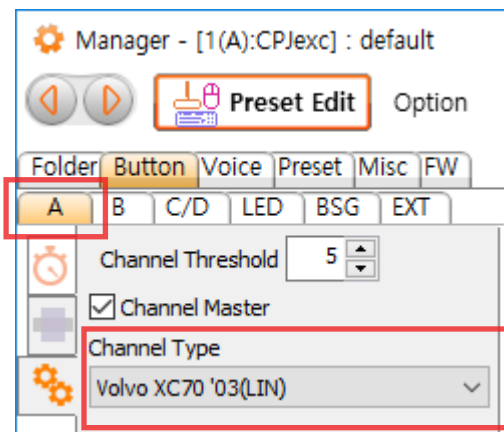
Connect Radio data signal to Channel A.



Turn off both DIP switch 1 and 2.

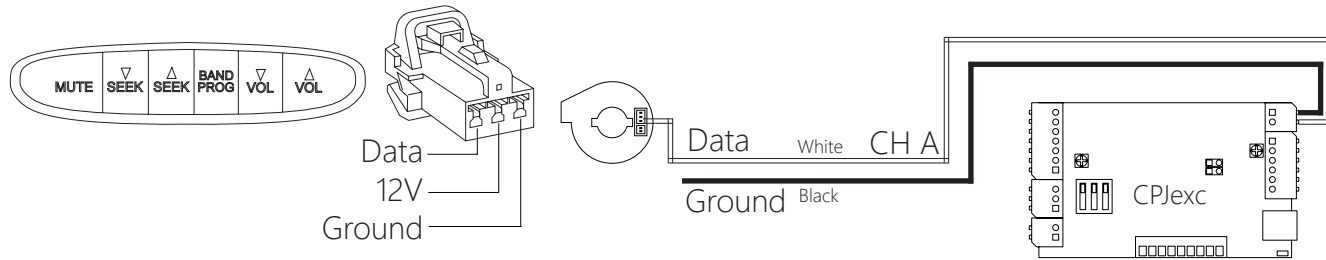


Choose [Button] -> [ A ]-> [Configure], select Channel Type as Volvo XC70 '03.

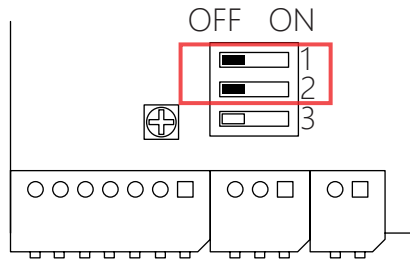


### 5-4-4. Hyundai Marcia Sonata2/3

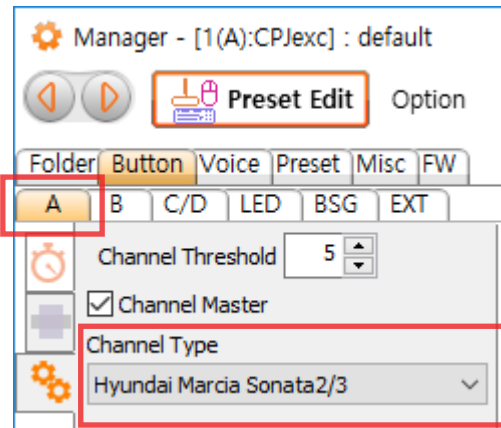
Connect Radio control data to Channel A.



Turn off both DIP switch 1 and 2.

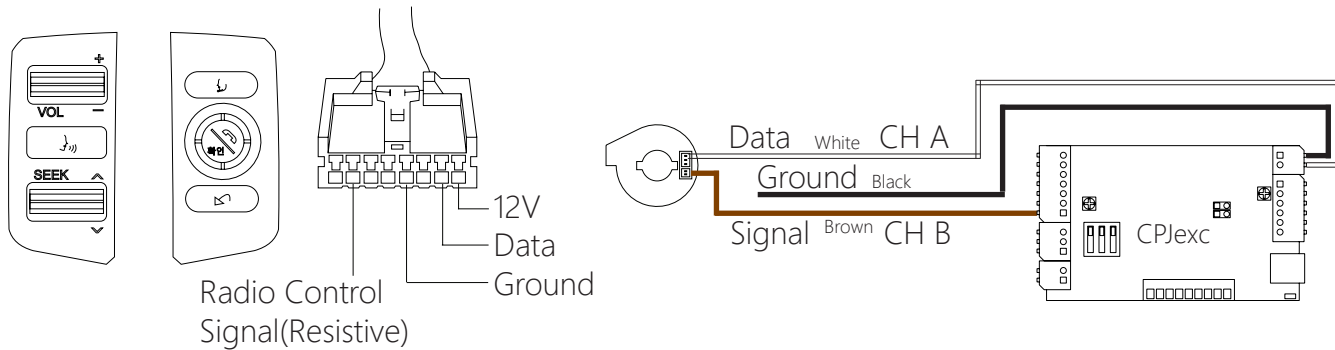
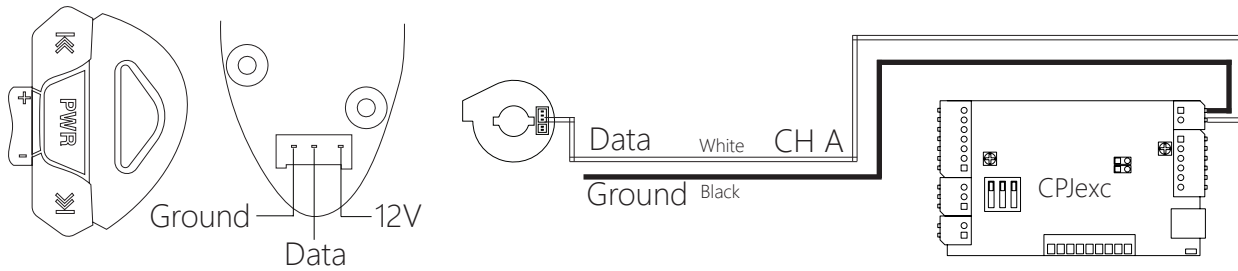


Choose [Button] -> [ A ]-> [Configure],  
select Channel Type as Hyundai Marcia Sonata2/3.

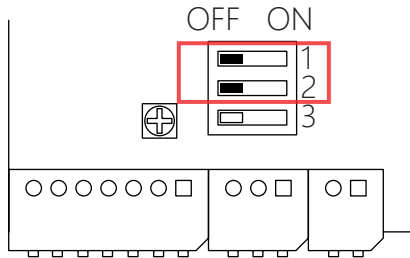


### 5-4-5. Renault SM

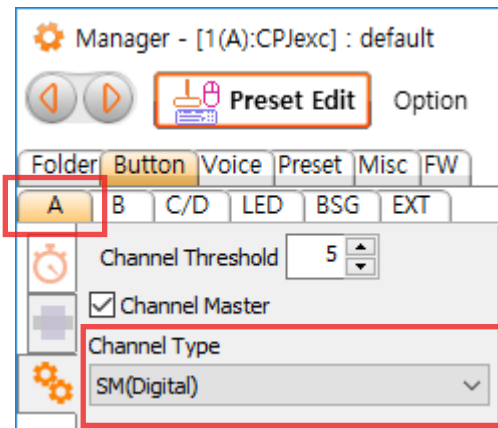
Connect Radio control signal to Channel A.



Turn off both DIP switch 1 and 2.



Choose [Button] -> [ A ]-> [Configure], select Channel Type as SM(Digital).

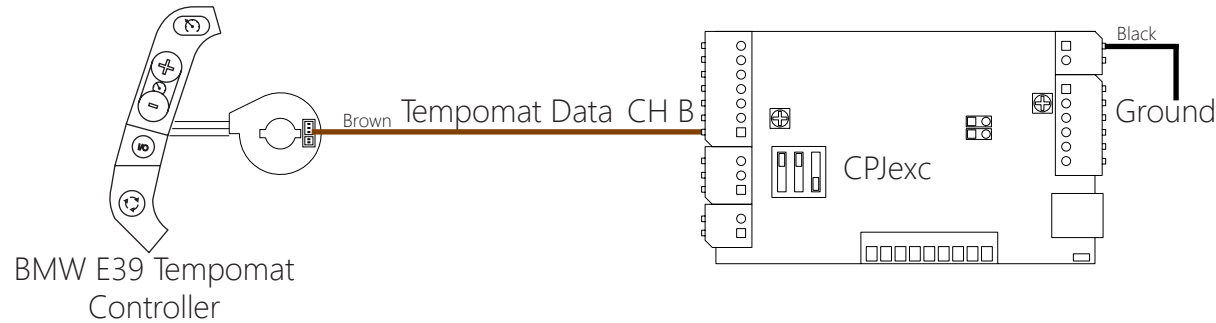


### 5-4-6. BMW Tempomat Controller

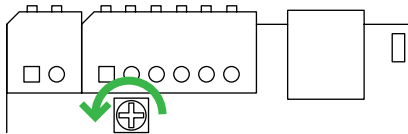
Connect Tempomat Data wire to Channel B.

Do not configure IBUS and Tempomat at the same time.

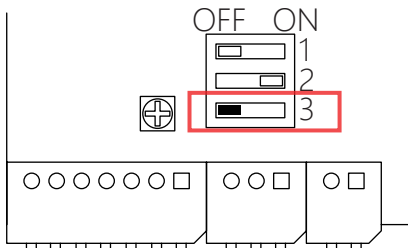
If the channel B is configured as BMW tempomat, IBUS message can be missed because reading tempomat signal takes too long time.



Turn the Adjustment B dial to the end of counterclockwise.

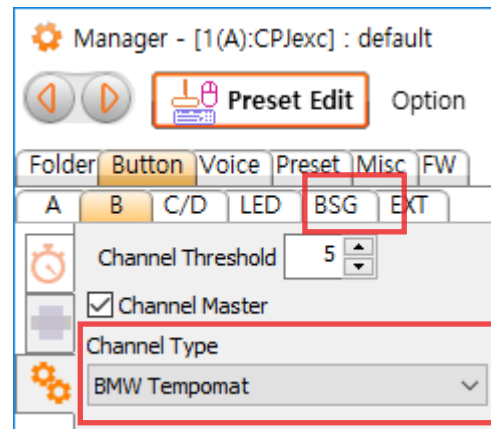


Turn off DIP switch 3 for tempomat signal on Channel B.



\*12V power(ACC) must be supplied to CPJexc for BMW Tempomat.

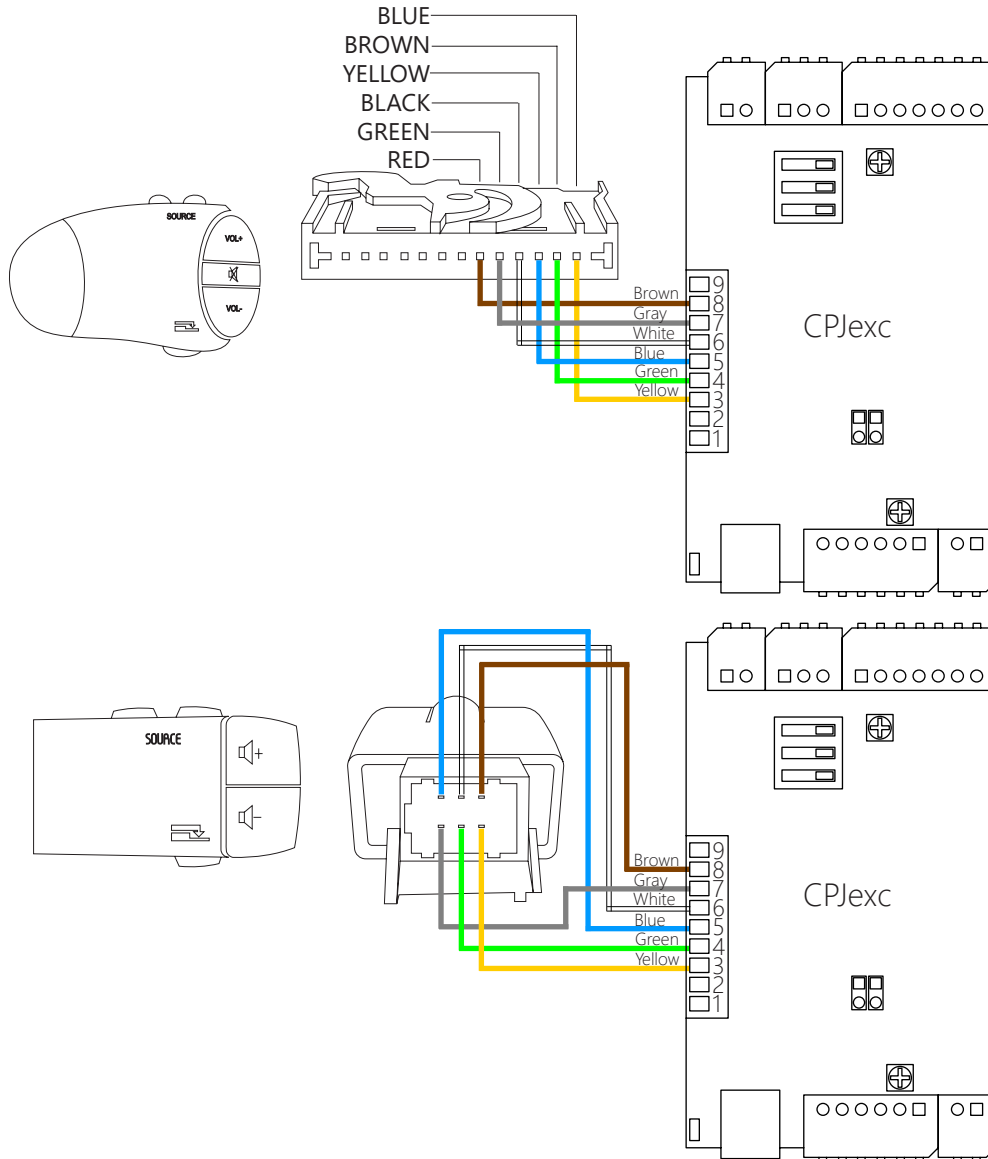
Choose [Button] -> [ B ]-> [Configure], select Channel Type as BMW Tempomat.



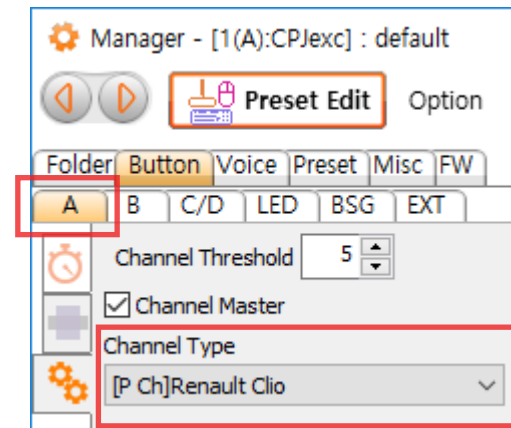
## 5-5. Wiring of parallel channel

Connect the wires of the steering wheel controller to the Parallel Channel, as the diagrams and select Vehicle type at the MISC tab. And perform "Auto Detect" at setting page in the Button tab. Parallel Channel is recognized as CH A or B at Manager.

### 5-5-1. Renault Clio

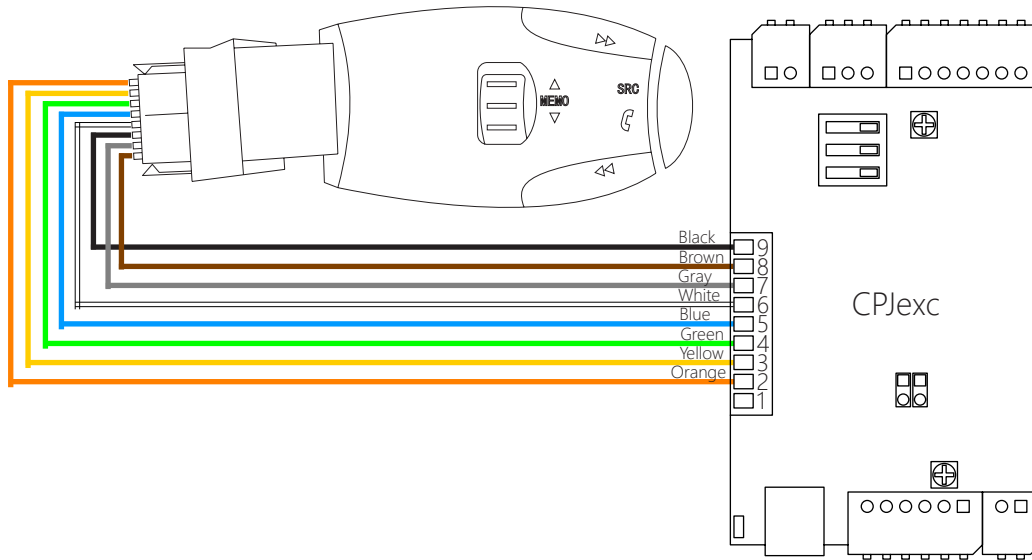


Choose [Button] -> [ A ]-> [Configure], select Channel Type as [P Ch]Renault Clio.

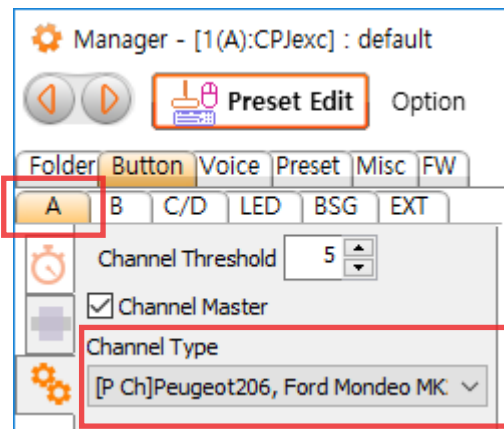


### 5-5-2. Peugeot 206 307 406

Connect Radio control signal to Parallel Channel.



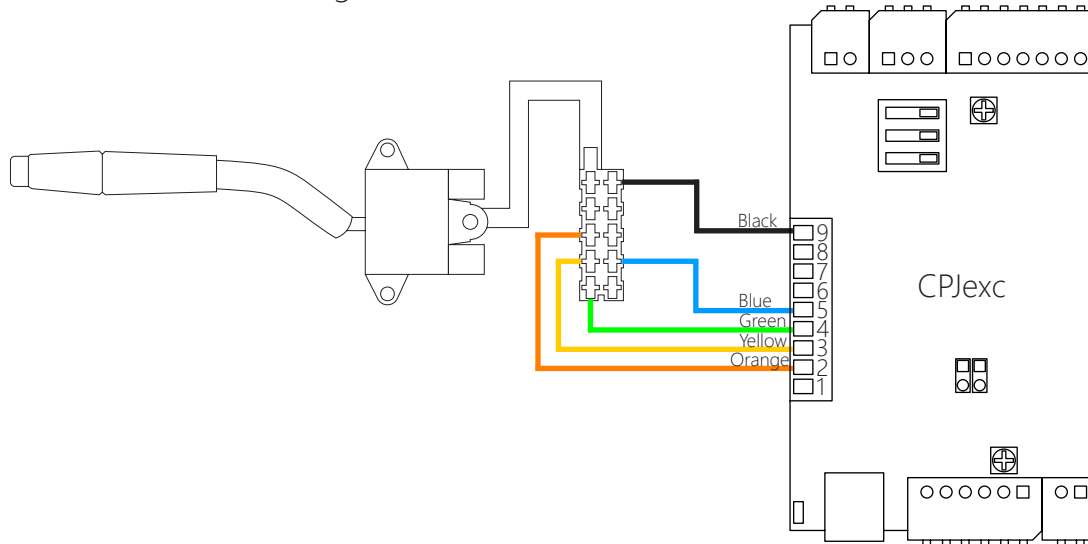
Choose [Button] -> [ A ]-> [Configure],  
select Channel Type as [P Ch]Peugeot206, Ford Mondeo MK2.



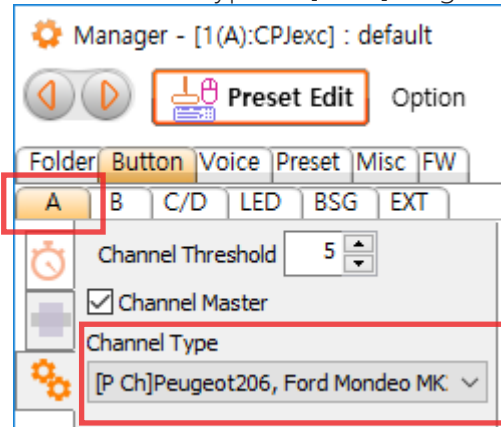


### 5-5-3. Peugeot 306

Connect Radio control signal to Parallel Channel.

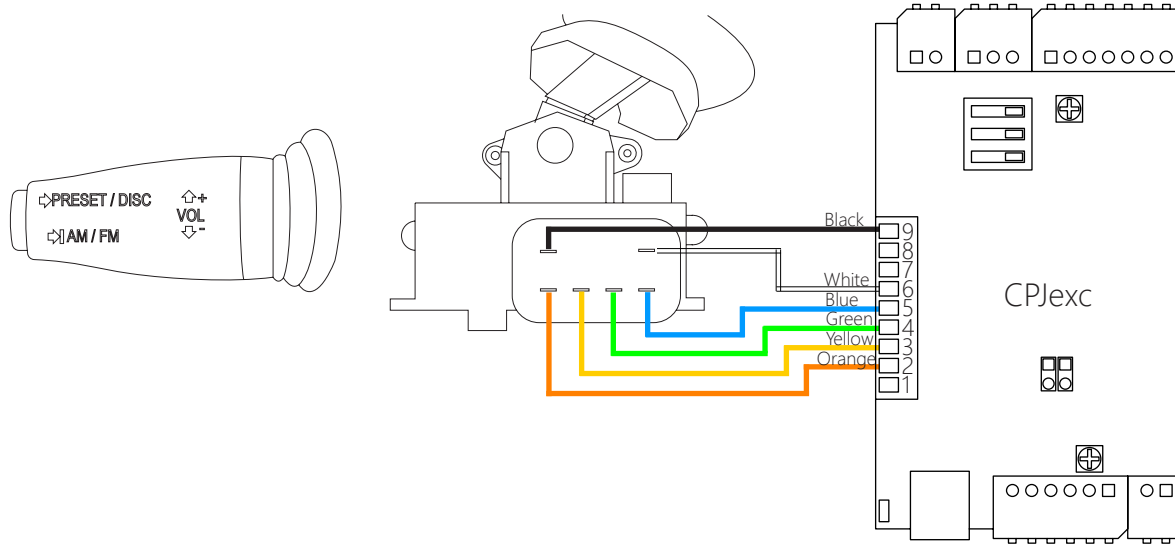


Choose [Button] -> [ A ]-> [Configure],  
select Channel Type as [P Ch]Peugeot206, Ford Mondeo MK2.

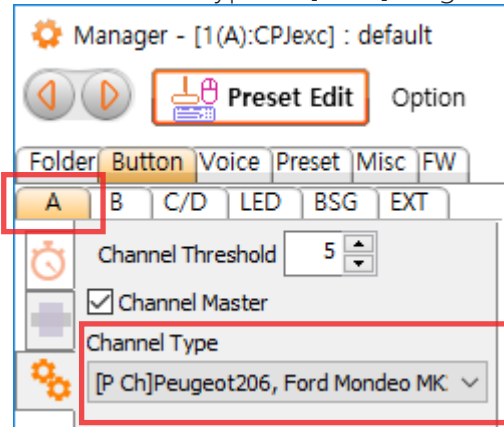


### 5-5-4. Ford Mondeo MK2 '96-'00

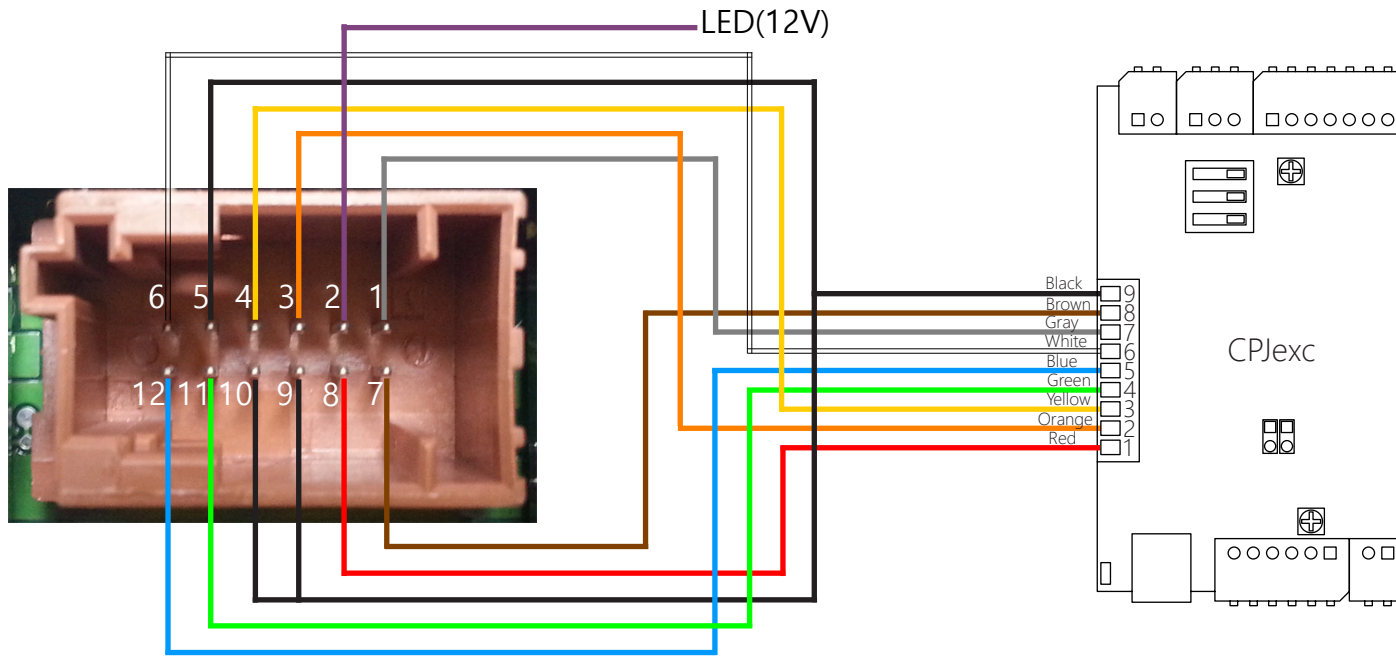
Connect Radio control signal to Parallel Channel.



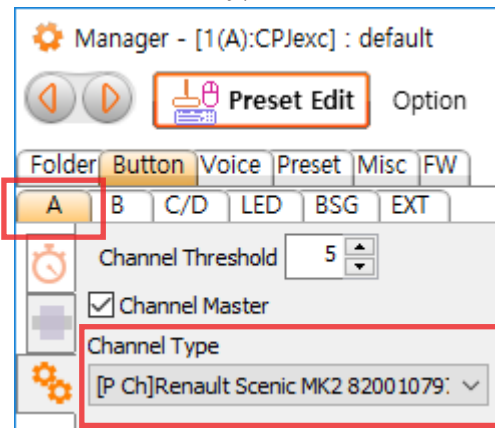
Choose [Button] -> [ A ]-> [Configure],  
select Channel Type as [P Ch]Peugeot206, Ford Mondeo MK2.



### 5-5-5. Renault Scenic MK2 8200107974



Choose [Button] -> [ A ]-> [Configure],  
select Channel Type as Renault Scenic MK2 8200107974.



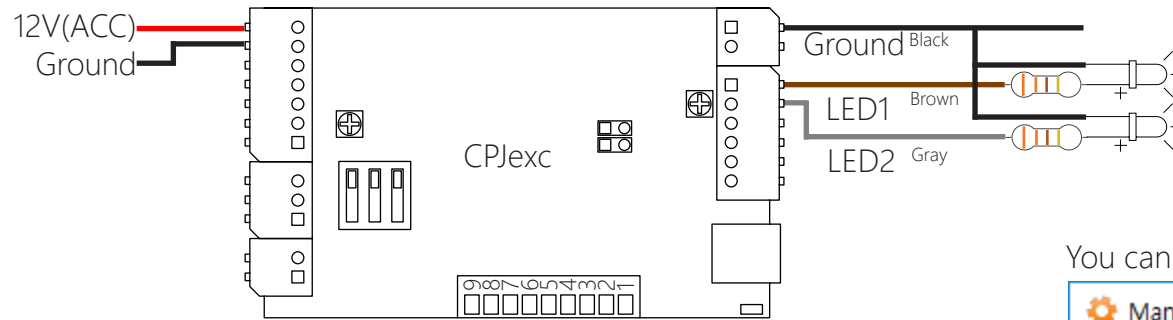
## 6. POWER and LED

External Power is required for CPJexc to work when the PC power is off.

Connect ACC(12V) to 7 pin, connect chassis ground to 6 pin.

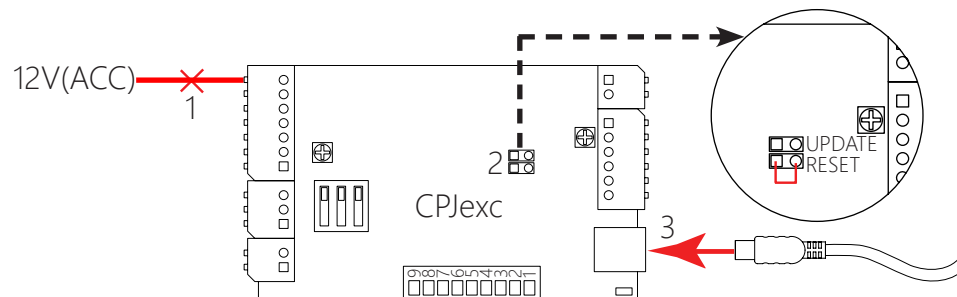
For external LED, a current limit resistor(usually 330ohm) must be connected in series.

Without the current limit resistor, LED burns out. Black wire is Ground. LED output is 5V.

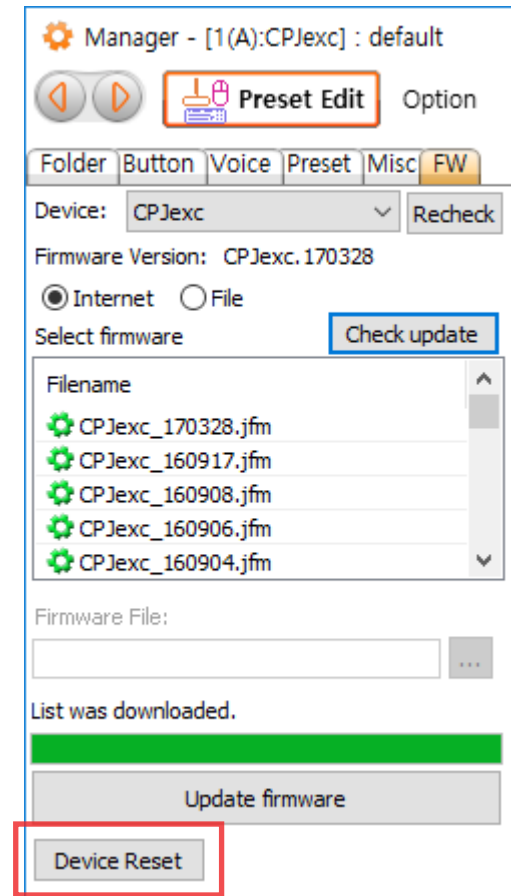


## 7. Factory Reset

1. Remove the external power.
2. Short-circuit two reset points.
3. Connect USB.



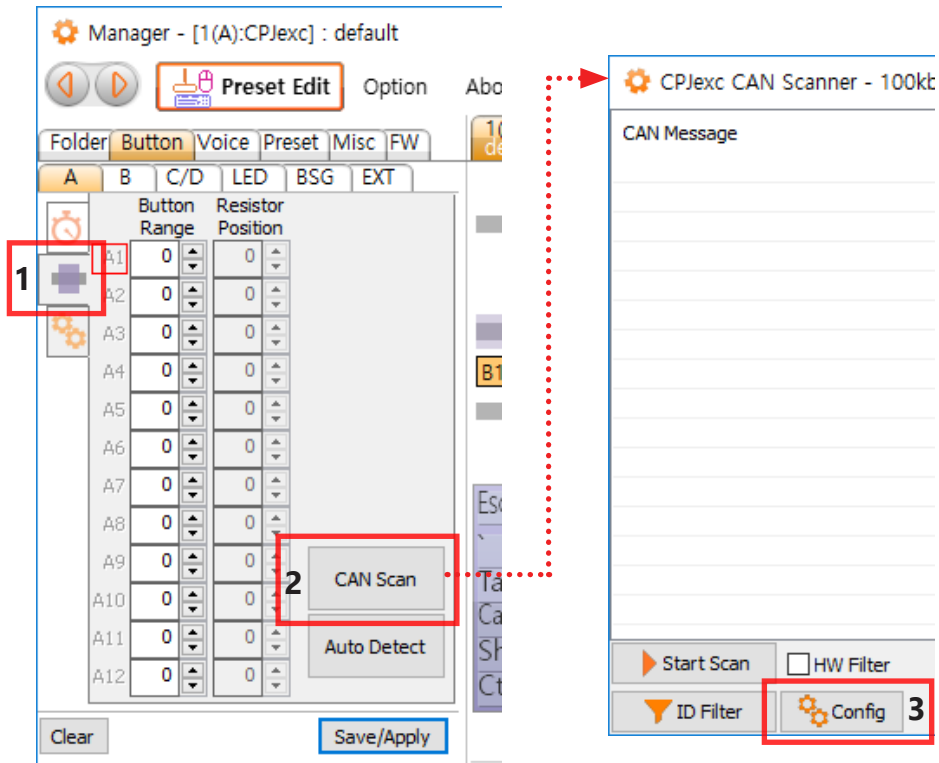
You can also reset the device at the FW tab in Manager.



## 8. CAN Button Setup

### 8-1. CAN BUS Configuration

Choose [Button] -> [ A ]-> [Range and Position], click **CAN Scan**, then **CPJexc CAN Scanner** pops up.

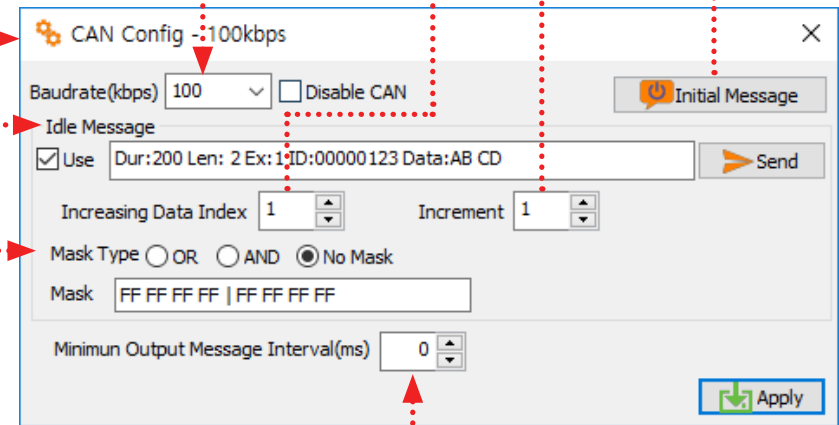


Idle message is sent on CAN BUS periodically by Duration("Dur:"). Idle message is required to receive data from some device(eg. I-Drive Controller).

Increasing Data Index:  
The data of the Idle Message is increased by **Increment** every time it is sent.  
**Increment** can be -128 ~ 127.

Baudrate of CAN BUS in kbps

See section 8-6.



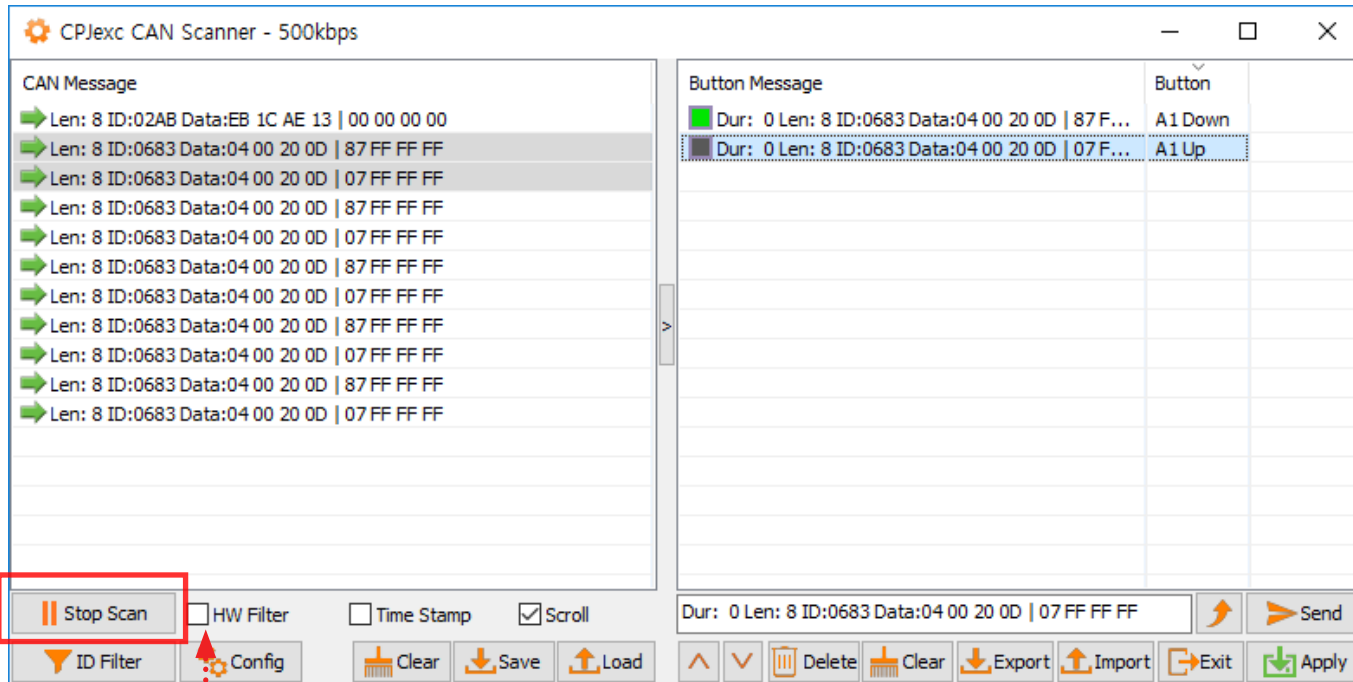
Minimum Output Message Interval(ms):  
Once a CAN message is sent, the next CAN message is sent after this period. This is applied for every CAN message that is sent from CPJexc. This prevents the sent CAN messages to be too close each other.

Mask:  
To send the increasing data 0~0Fh, the data need to be ANDed with 0x0F.  
To send the increasing data F0h~FFh, the data need to be ORed with 0xF0.

## 8-2. CAN message Scanning

If you don't know the CAN message of the steering wheel control button, you need to find it. When the Scan started, numerous CAN message will be listed in the CAN message list.

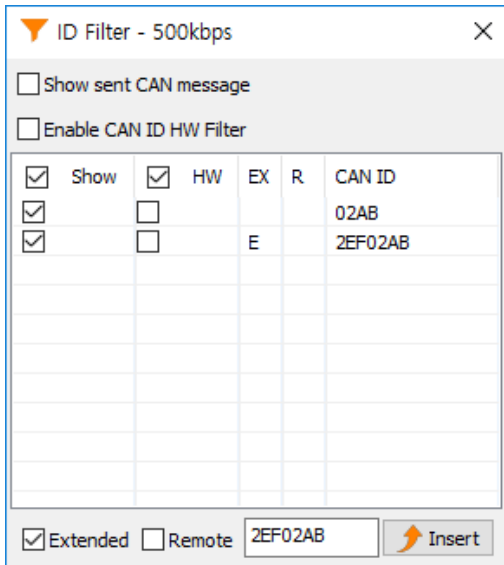
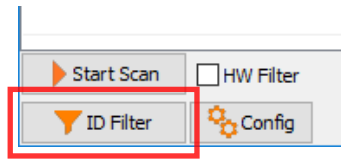
To Scan the CAN messages, click **Start Scan**.



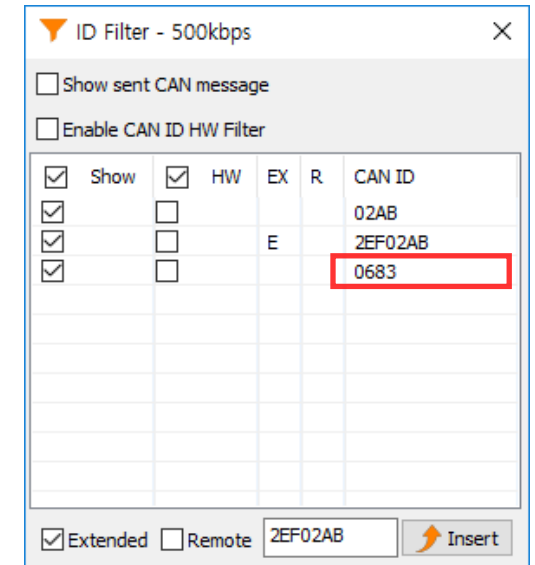
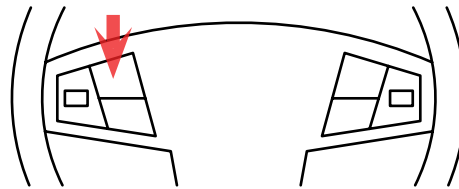
At first scanning, turn off HW Filter to Scan all the messages.

Save or load the CAN messages as a file(.can).

The steering wheel control message has its own CAN ID or IDs. We need to see only the steering wheel control CAN ID.  
Click ID Filter to see the ID Filter dialog. All the scanned CAN IDs are listed in the ID Filter list.



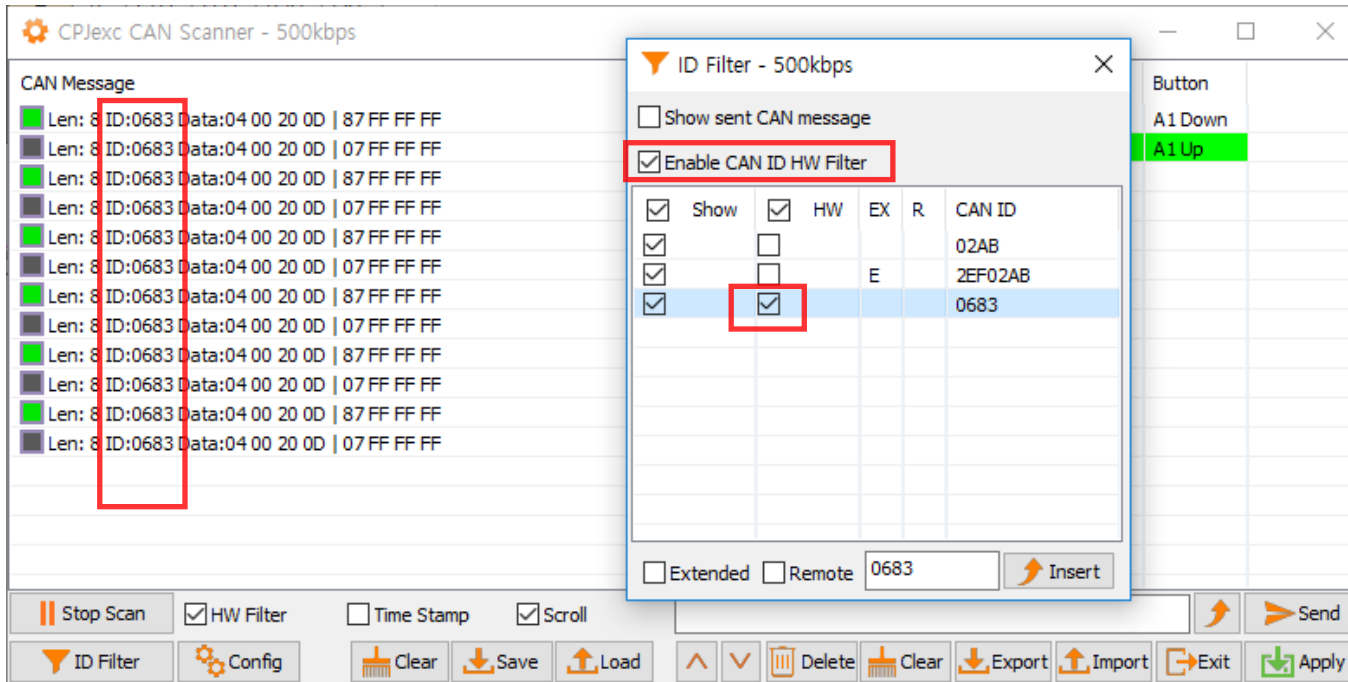
Push the steering wheel buttons repeatedly.



When you push the steering wheel button repeatedly, a new ID will appear at the end of the ID filter list.  
This is the steering wheel control's CAN ID.

To filter out the the CAN message with the steering wheel control's CAN ID, enable the HW Filter. Check the box Enable CAN ID HW Filter and HW of the steering wheel control's CAN ID. Then CPJexc received only the CAN message of the steering wheel control.

Because there is too many CAN messages to receive all the CAN messages on the CAN BUS, leave the HW Filter enabled after the scanning is finished.

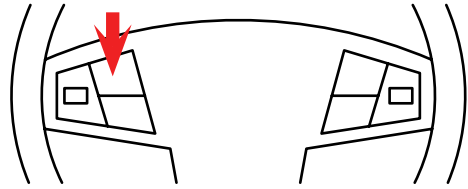




### 8-3. CAN Button Message Registering

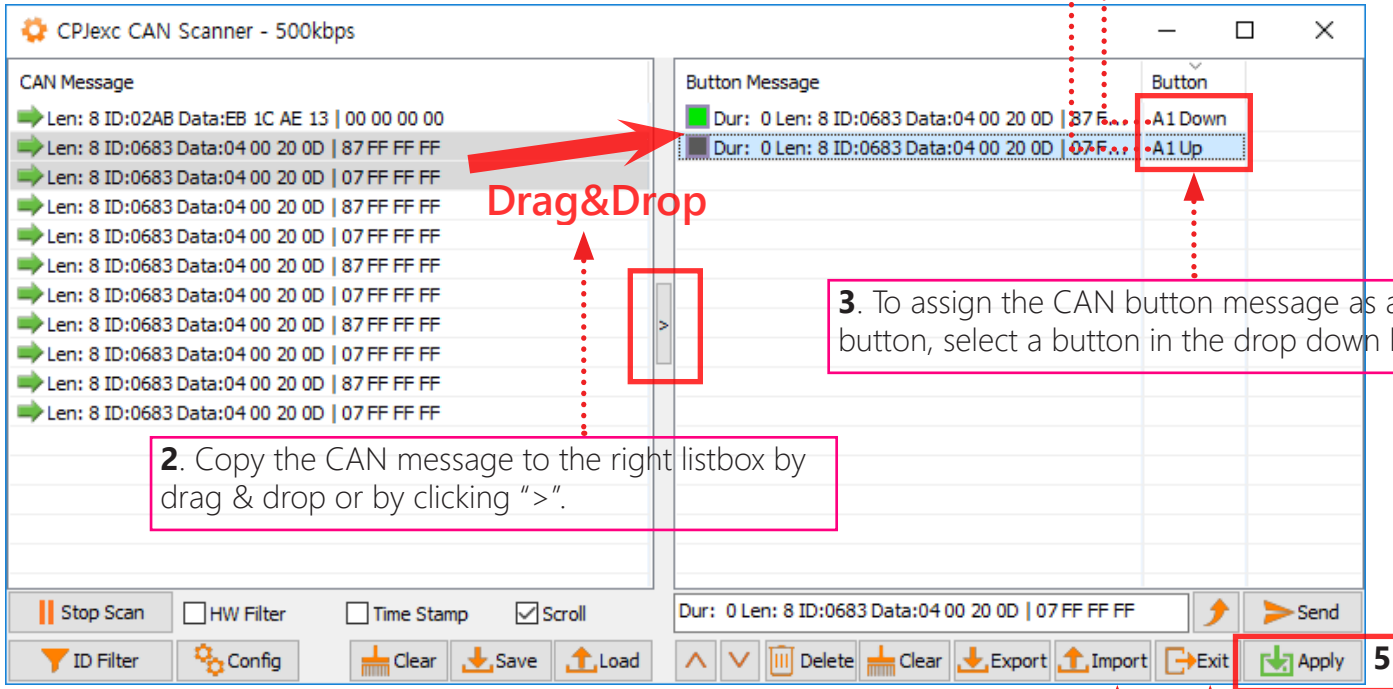
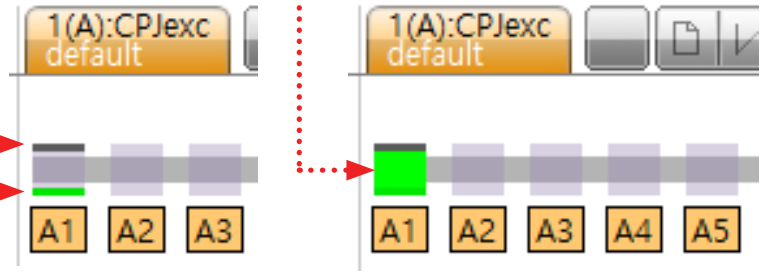
To use a CAN message as a button, the CAN message need to be registered as a Button Message.

1. Press the steering wheel buttons, CAN messages are listed at left listbox.



4. Up Button appears as a gray bar, Down Button appears as a green bar.

The button bar turns to green when the steering wheel button is pushed.



2. Copy the CAN message to the right listbox by drag & drop or by clicking ">".

3. To assign the CAN button message as a button, select a button in the drop down list.

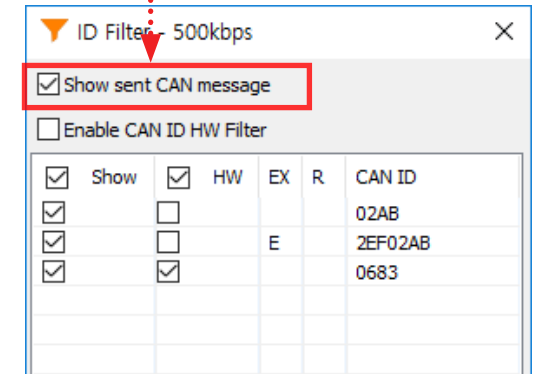
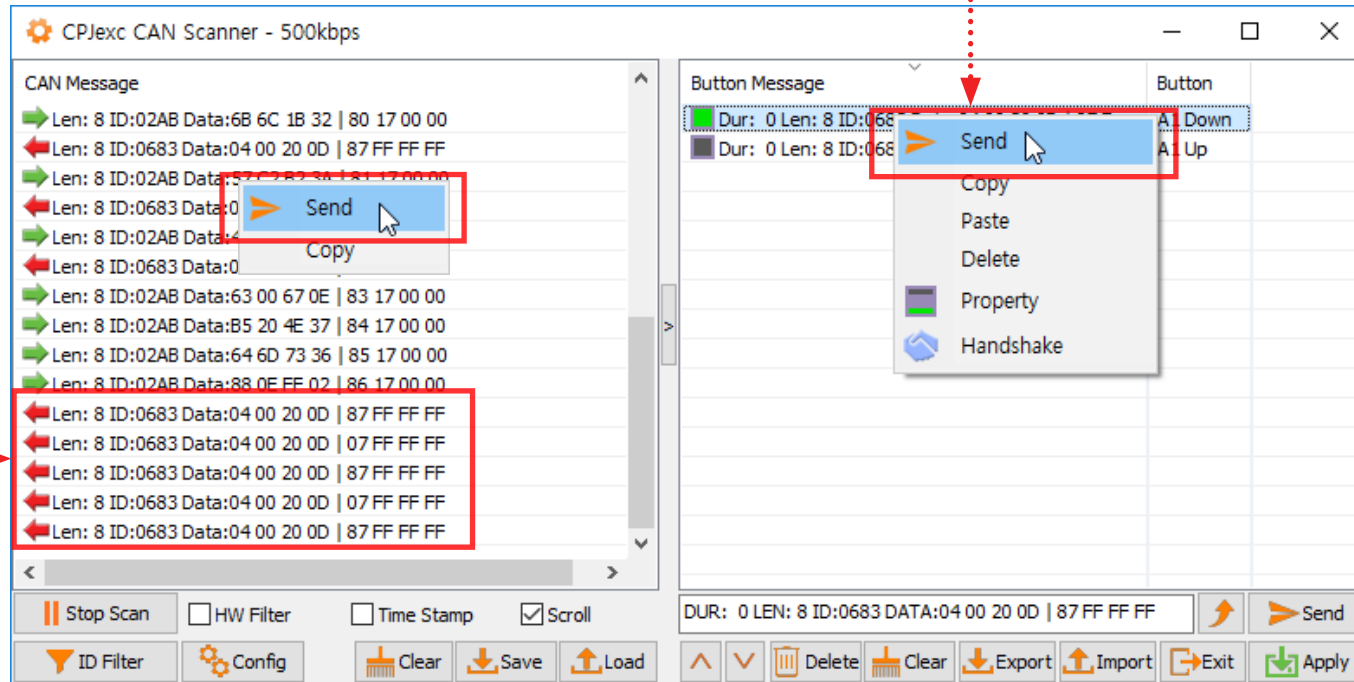
A Button is composed of Down and Up message. If a down button message is repeated periodically with being pressed and there is no up button message(eg. volume button), set the duration above 0. The unit of "Dur" is 10ms. CAN button can be assigned to any channel button.

Export or import the CAN button messages as a file(.cbn).

## 8-4. Send CAN message

You can send the CAN message on the CAN BUS with **Send** context menu or by double-clicking the CAN message in the listbox.

If the **Show sent CAN message** is checked, the CAN message sent on the CAN BUS is listed in the CAN message listbox.

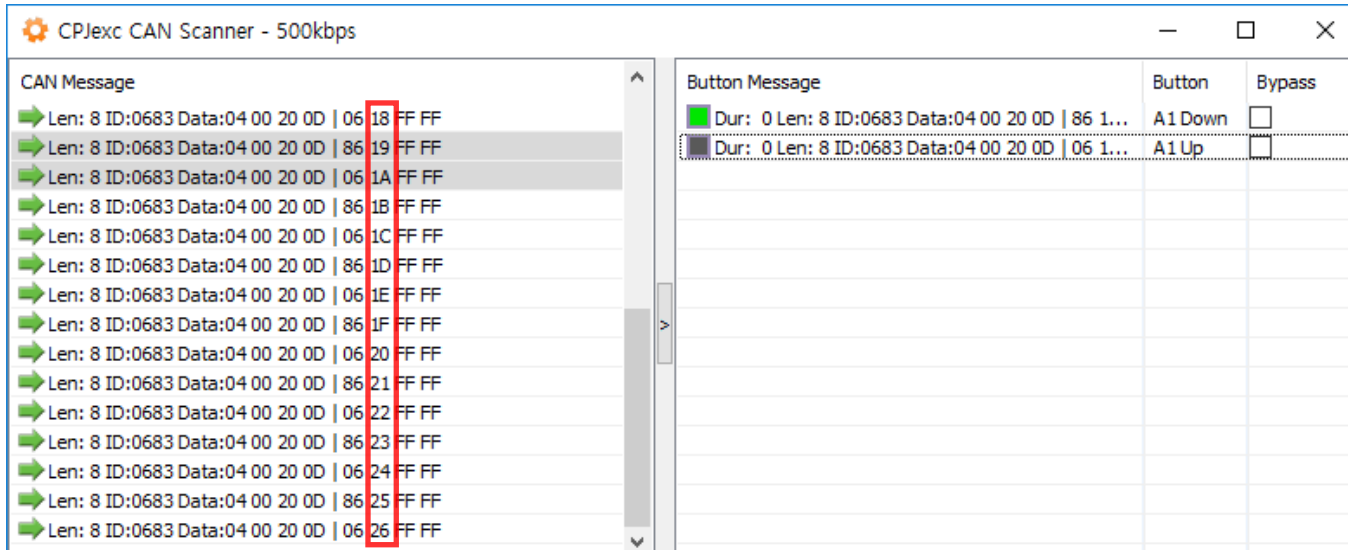


## 8-5. CAN DATA Bit Mask

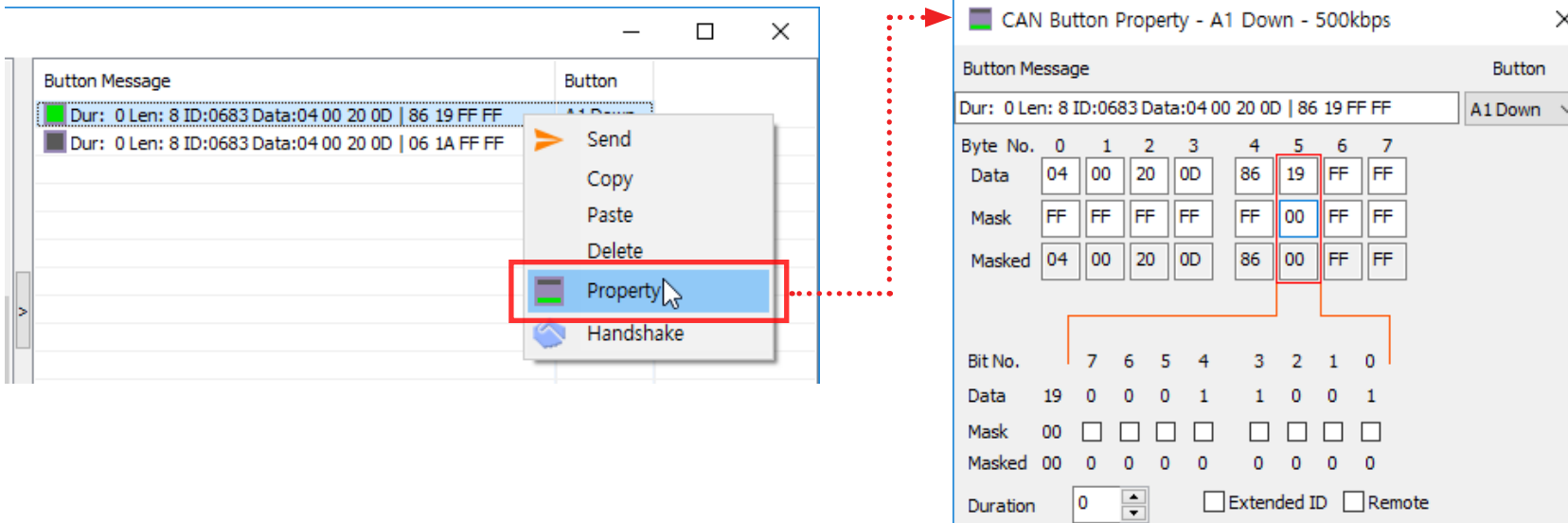
In some CAN system, the CAN button message includes an increasing data, to prevent the data to be processed more than once.

We need to ignore this variable data to identify the CAN button message exactly.

CPJexc provide CAN DATA bit mask to ignore the variable data.



Unexpected data bits can be ignored by setting the mask bits as 0.



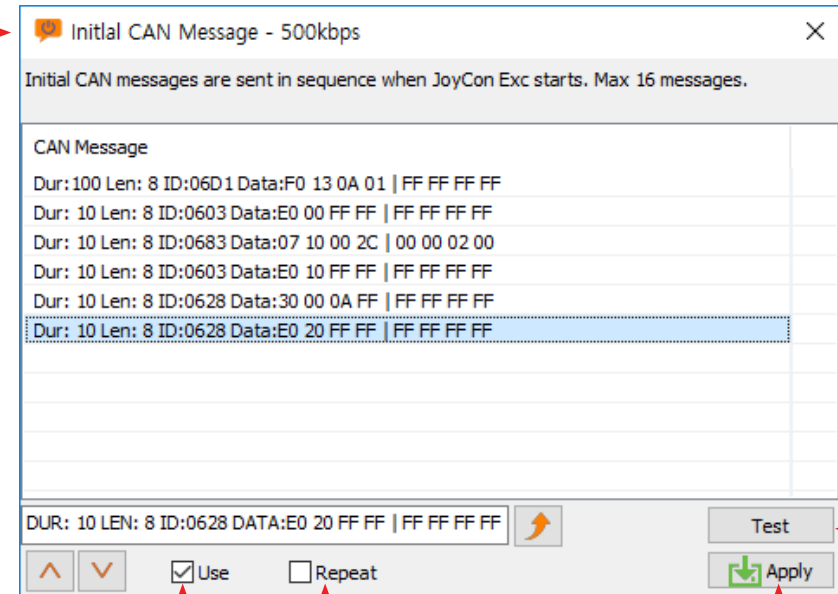
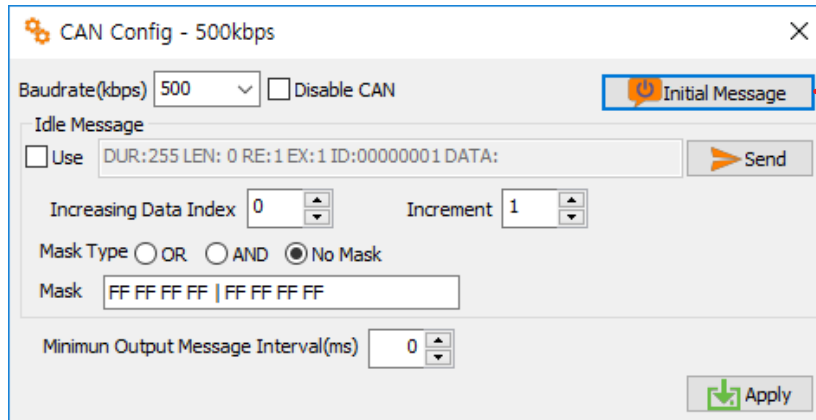
## 8-6. Initial Messages

When CPJexc starts, Initial Messages are sent to initialize the steering wheel controls or to inform other equipments that the car radio exist.

The CAN messages are sent as the list sequence.

The interval of the messages are determined by the duration(Dur:).

The Initial CAN messages can be max 16.



Enable or Disable Initial Messages.

The messages in the list are sent repeatedly.

Apply the Initial CAN messages in the list to CPJexc.

Send the applied Initial Messages once for test.

## 8-7. Handshake

In some CAN system, the steering wheel button waits for the Handshake message after it sends a button message.(eg. 2014 Nissan Altima S)  
 If the steering wheel button does not receive the handshake message, it wait for the handshake permanently, sending the same button message repeatedly.

CPJexc can send a handshake message for each button message.



Check the box to enable Handshake for this Button Message.

The screenshot shows the CPJexc CAN Scanner interface. On the left, the 'CAN Message' list contains three entries. The middle section shows a 'Button Message' table with columns for 'Dur', 'Len', 'ID', and 'Data'. A context menu is open over a button message, with the 'Handshake' option highlighted. On the right, a configuration window for 'CAN Button Handshake - A1 Down - 500kbps' is open, showing the 'Use Handshake' checkbox checked, the 'Button Message' details, and the 'Handshake Message' configuration.

If you want to see the the handshake message in the CAN message List, check the box **Show sent CAN message** in the ID Filter.


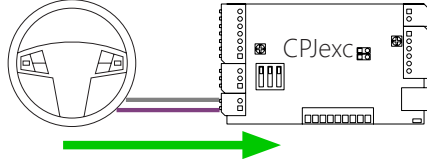







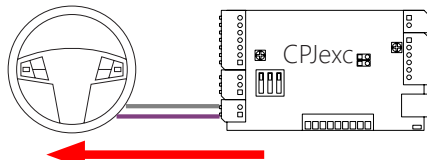



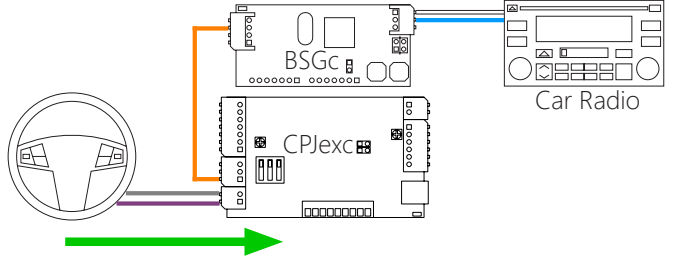

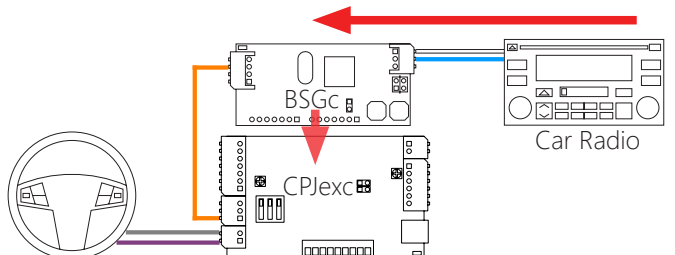

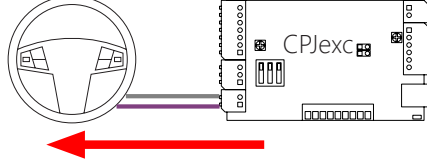
The ID Filter window shows the 'Show sent CAN message' checkbox checked, which is highlighted with a red box and a red arrow pointing from the text above.

The CAN message which is sent back as a respond.

Check the box if data of the received button message is sent back(as it is) in the handshake message.  
 The data of Handshake message is replaced with the byte checked.  
 (The received data can be variable, the variable data is inserted in the handshake message as it is.)

## 8-8. The icons of CAN scanner

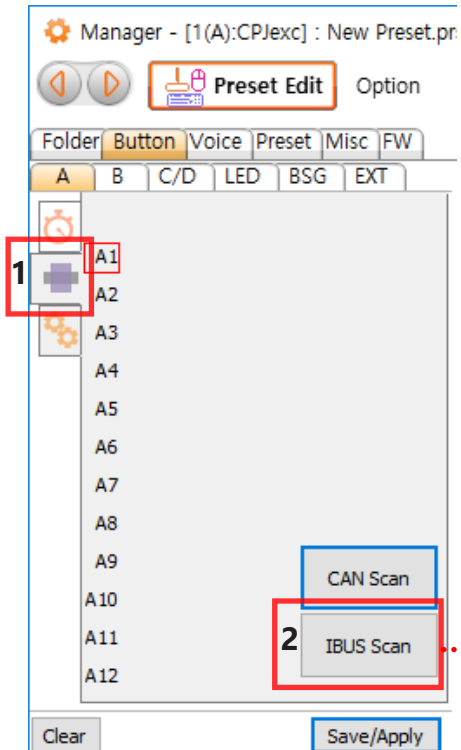
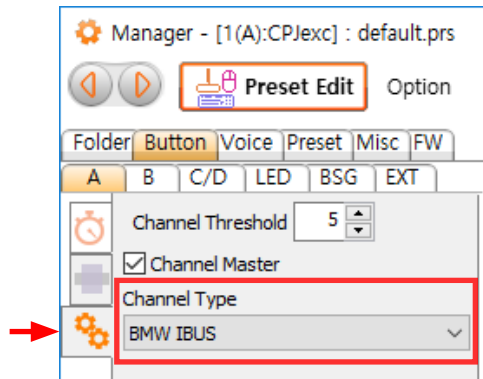
The icons of CAN scanner list means the origin of the CAN message.

	Origin	Destination	Port	Description	
	Steering wheel controls	CPJexc	2Pin CAN Connector	The CAN message which is received from 2Pin CAN Connector	
	Steering wheel controls	CPJexc	2Pin CAN Connector	If the CAN message which is registered as a Down Button,  is replaced with  .	
	Steering wheel controls	CPJexc	2Pin CAN Connector	If the CAN message which is registered as a Up Button,  is replaced with  .	
	CPJexc	Steering wheel controls	2Pin CAN Connector	When "Show send CAN message" option is enabled.	
	Steering wheel controls	CPJexc	2Pin CAN Connector	When BSGc is enabled and "Bypass Steering wheel Control to Head unit" option is enabled,  is replaced with  .	
	Car Radio	CPJexc	BSGc	When BSGc is enabled and "Bypass Head unit to Steering wheel Control" option is enabled.	
	CPJexc	Steering wheel controls	2Pin CAN Connector	Handshake	

## 9. IBUS Button Setup

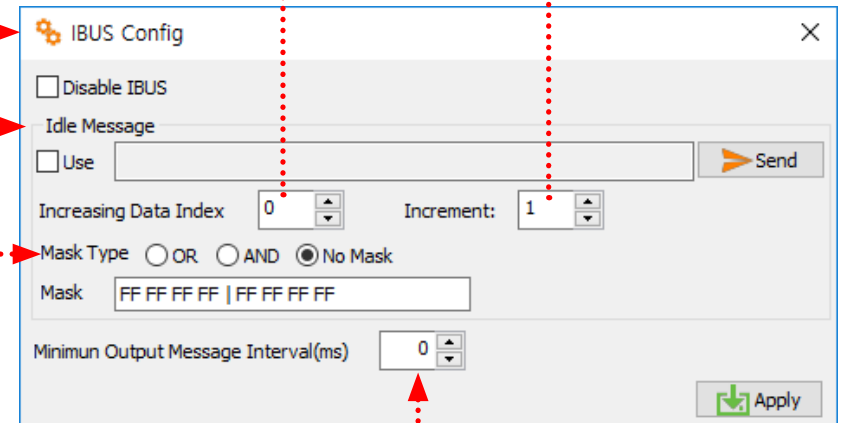
### 9-1. IBUS Configuration

Choose [Button] -> [ A ]-> [Configure], select Channel Type as BMW IBUS.  
 Choose [Button] -> [ A ]-> [Range and Position], click **IBUS Scan**,  
 then **CPJexc IBUS Scanner** pops up.



Idle message is sent on IBUS periodically by Duration("Dur:").

Increasing Data Index:  
 The data of the Idle Message is increased by **Increment** every time it is sent.  
**Increment** can be -128 ~ 127.



Minimum Output Message Interval(ms):  
 Once a IBUS message is sent, the next IBUS message is sent after this period. This is applied for every IBUS message that is sent from CPJexc. This prevents the sent IBUS messages to be too close each other.

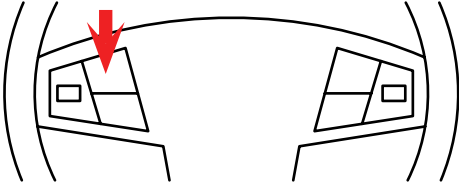
Mask:  
 To send the increasing data 0~0Fh, the data need to be ANDed with 0x0F.  
 To send the increasing data F0h~FFh, the data need to be ORed with 0xF0.

## 9-2. IBUS Message Scanning

If you don't know the IBUS message of the steering wheel control button, you need to find the IBUS message of the steering wheel button.

1. To Scan the IBUS messages, click **Start Scan**.

2. Push the steering wheel buttons, IBUS messages are listed at left listbox.



CPJexc IBUS Scanner

IBUS Message	Button Message	Button
Len: 4 sID:50 dID:68 Data:32 10	Dur: 0 Len: 4 sID:50 dID:68 Data:3B 01	A1 Down
Len: 4 sID:50 dID:68 Data:32 10	Dur: 0 Len: 4 sID:50 dID:68 Data:3B 21	A1 Up
Len: 4 sID:50 dID:68 Data:3B 08		
Len: 4 sID:50 dID:68 Data:3B 28		
Len: 3 sID:50 dID:C8 Data:01		
Len: 4 sID:50 dID:C8 Data:3B 80		
Len: 4 sID:50 dID:C8 Data:3B A0		
Len: 4 sID:50 dID:5B Data:3A 01		
Len: 4 sID:50 dID:5B Data:3A 00		
Len: 4 sID:50 dID:68 Data:3B 01		
Len: 4 sID:50 dID:68 Data:3B 21		
Len: 4 sID:50 dID:68 Data:3B 01		
Len: 4 sID:50 dID:68 Data:3B 21		
Len: 4 sID:50 dID:68 Data:3B 01		
Len: 4 sID:50 dID:68 Data:3B 21		

HW Filter     Time Stamp     Scroll

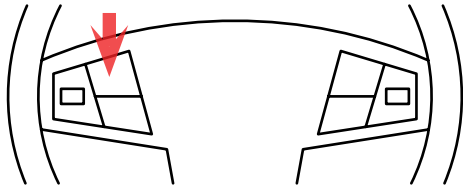
Save or load the CAN messages as a file(.ibs).



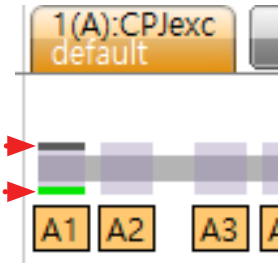
### 9-3. IBUS Button Message Registering

To use an IBUS message as a button, the IBUS message need to be registered as a Button Message.

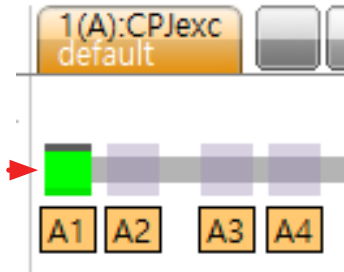
1. Press the steering wheel buttons, IBUS messages are listed at left listbox.



4. Up Button appears as a gray bar, Down Button appears as a green bar.



The Button bar turns to green when the steering wheel button is pushed.



CPJexc IBUS Scanner

IBUS Message

- Len: 4 sID:50 dID:68 Data:32 10
- Len: 4 sID:50 dID:68 Data:32 10
- Len: 4 sID:50 dID:68 Data:3B 08
- Len: 4 sID:50 dID:68 Data:3B 28
- Len: 3 sID:50 dID:C8 Data:01
- Len: 4 sID:50 dID:C8 Data:3B 80
- Len: 4 sID:50 dID:C8 Data:3B A0
- Len: 4 sID:50 dID:5B Data:3A 01
- Len: 4 sID:50 dID:5B Data:3A 00
- Len: 4 sID:50 dID:68 Data:3B 01
- Len: 4 sID:50 dID:68 Data:3B 21
- Len: 4 sID:50 dID:68 Data:3B 01
- Len: 4 sID:50 dID:68 Data:3B 21
- Len: 4 sID:50 dID:68 Data:3B 01
- Len: 4 sID:50 dID:68 Data:3B 21

Button Message

- Dur: 0 Len: 4 sID:50 dID:68 Data:3B 01
- Dur: 0 Len: 4 sID:50 dID:68 Data:3B 21

Button

- A1 Down
- A1 Up

Drag&Drop

2. Copy the IBUS message to the right listbox by drag & drop or by clicking ">".

3. To assign the IBUS button message as a button, select a button in the drop down list.

5

A Button is composed of Down and Up message.  
If a down button message is repeated periodically with being pressed and there is no up button message(eg. volume button), set the duration above 0.  
The unit of "Dur" is 10ms.  
IBUS button can be assigned to any channel button.

Export or import the IBUS button messages as a file(.ibn).

### 9-4. IBUS ID Filter

If there are too many IBUS messages on the IBUS, some messages can be missed. You can filter out the IBUS messages you want using Hardware ID filter.

The detected IBUS source IDs are listed.

Manual insertion

You can send the IBUS message on the IBUS with **Send** context menu or by double-clicking the IBUS message in the listbox. If **Show sent IBUS message** is checked, the IBUS message sent on the IBUS is listed at IBUS Message listbox.

## 9-5. IBUS DATA Bit Mask

Unexpected data bits can be ignored by setting the mask bits as 0.

The image shows two screenshots. The left screenshot shows a list of button messages with a context menu open over the selected message 'Dur: 0 Len: 4 sID:50 dID:68 Data:3B'. The 'Property' option is highlighted with a red box. A red dotted arrow points from this box to the right screenshot.

The right screenshot is the 'IBUS Button Property - A1 Up' dialog. It displays the following configuration:

Byte No.	0	1	2	3	4	5	6	7
Data	3B	21						
Mask	FF	F0						
Masked	3B	20						

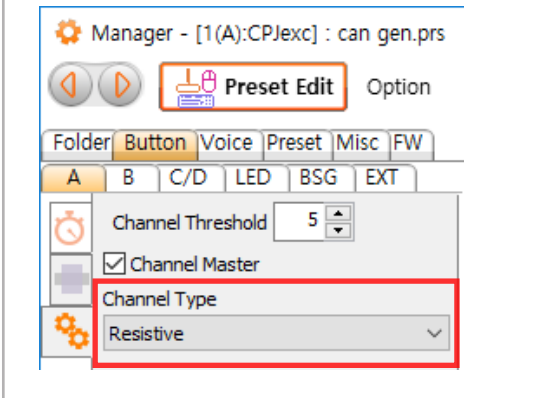
  

Bit No.	7	6	5	4	3	2	1	0
Data	21	0	0	1	0	0	0	1
Mask	F0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Masked	20	0	0	1	0	0	0	0

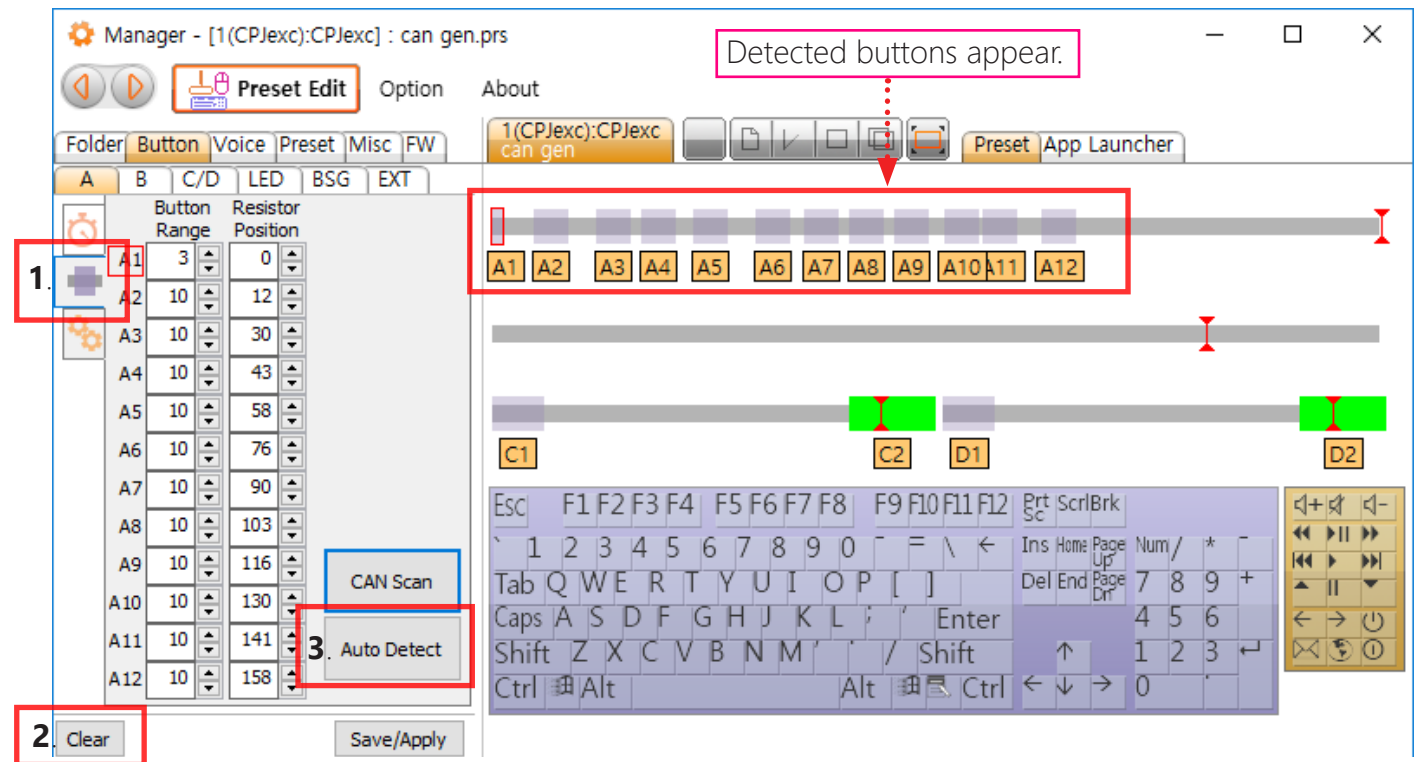
Duration: 0

## 10. Resistive Button Setup

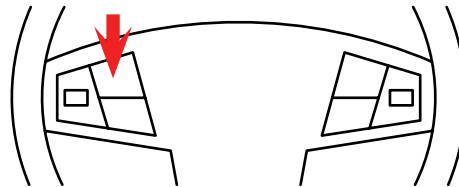
Choose [Button] -> [ A or B ]-> [Configure], select Channel Type as Resistive.



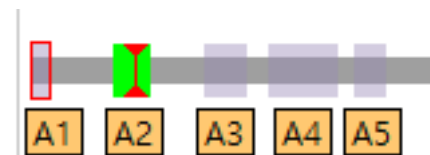
1. Choose [Button] -> [ A or B ]-> [Range and Position],
2. clear previous buttons,
3. click **Auto Detect**.



4. Press the steering wheel buttons one by one.



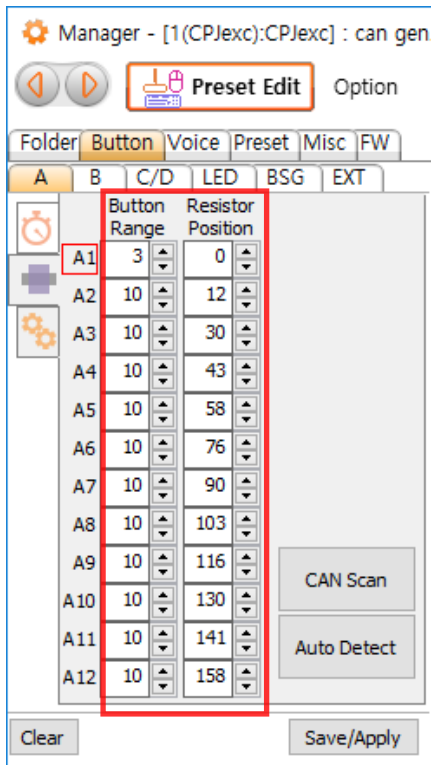
5. After all the buttons are detected, click **Auto Detect** again to finish auto-detection.



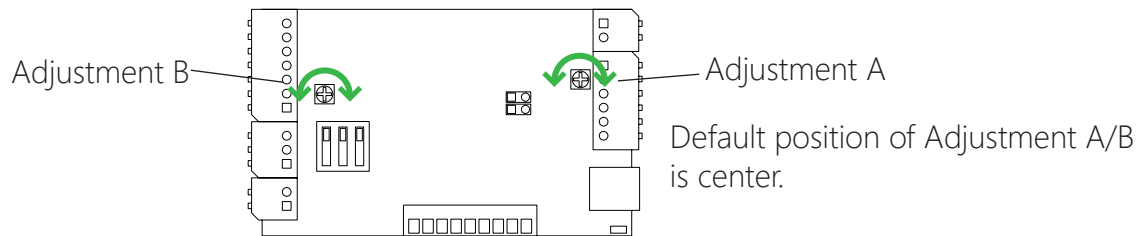
Button Range and Resistor Position of the buttons are stored in the onboard memory of CPJexc.

Button bar turns to green when the steering wheel button is pressed.

The resistance values can be fine tuned manually. After you change the values, click Save/Apply. Resistor range and position of the buttons are stored in the onboard memory of CPJexc.

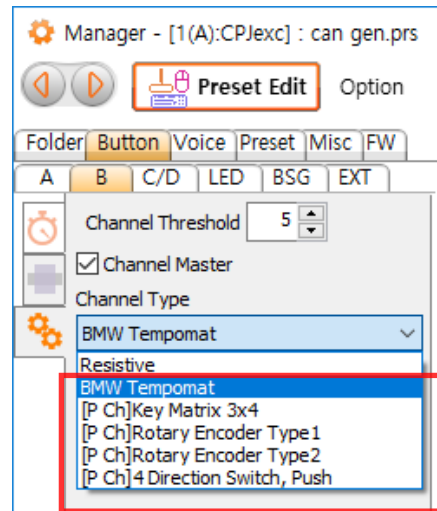
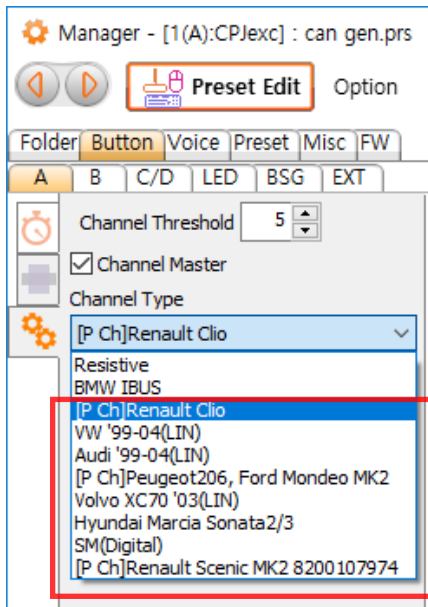


If the buttons in Manager are too close each other, tune the Adjustment A/B on the board.

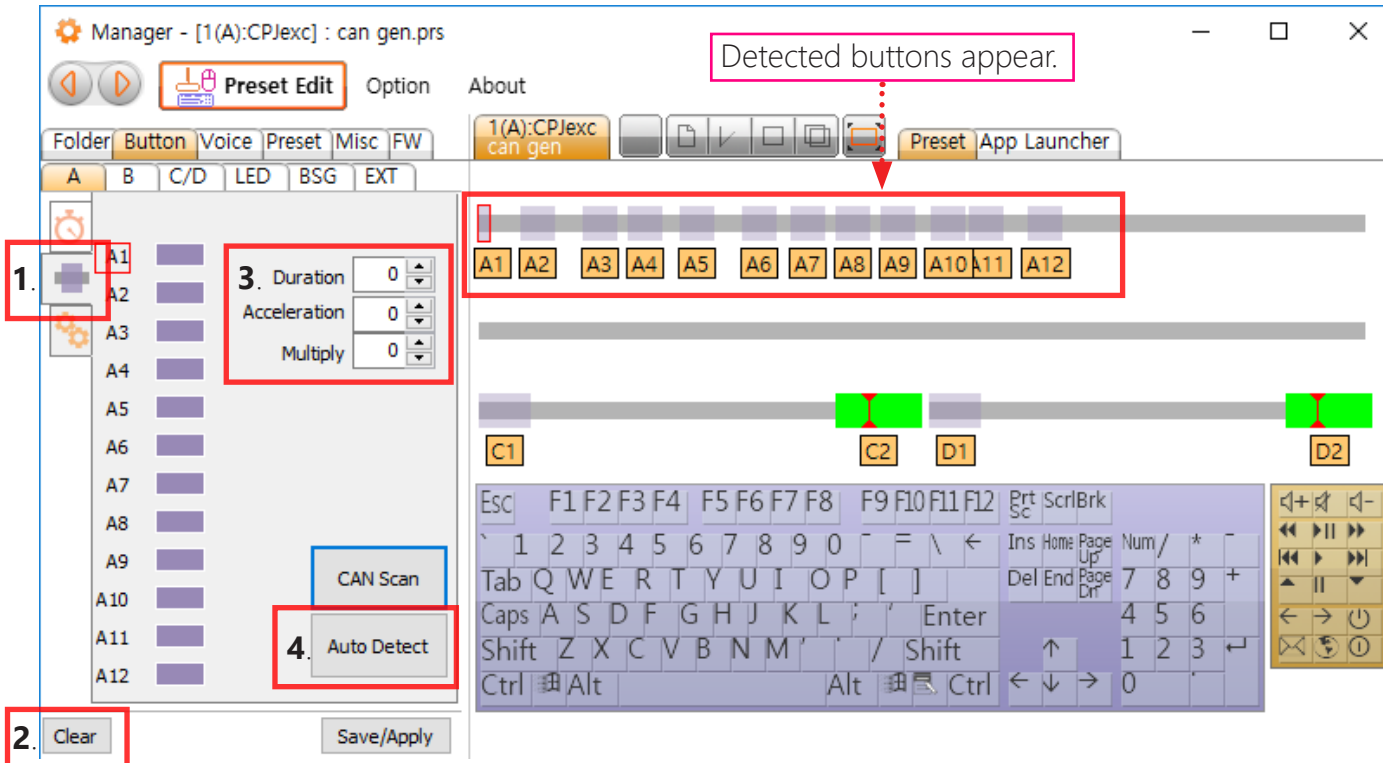


## 11. Digital Button Setup

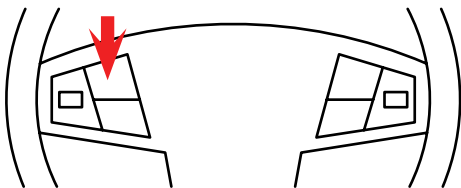
Choose [Button] -> [ A or B ]-> [Configure], select Channel Type as Digital.



1. Choose [Button] -> [ A or B ]-> [Range and Position],
2. clear previous buttons,
3. Set Signal Reading Parameters:  
Put above 0(about 4) at Duration for the rotational wheel.  
Put 0 at the rest of the parameters by default.
4. click **Auto Detect**.



5. Press the steering wheel buttons one by one.



6. After all the buttons are detected, click **Auto Detect** again to finish auto-detection.



Button bar turns to green when the steering wheel button is pressed.

Digital code of the buttons are stored in the onboard memory of CPJexc.

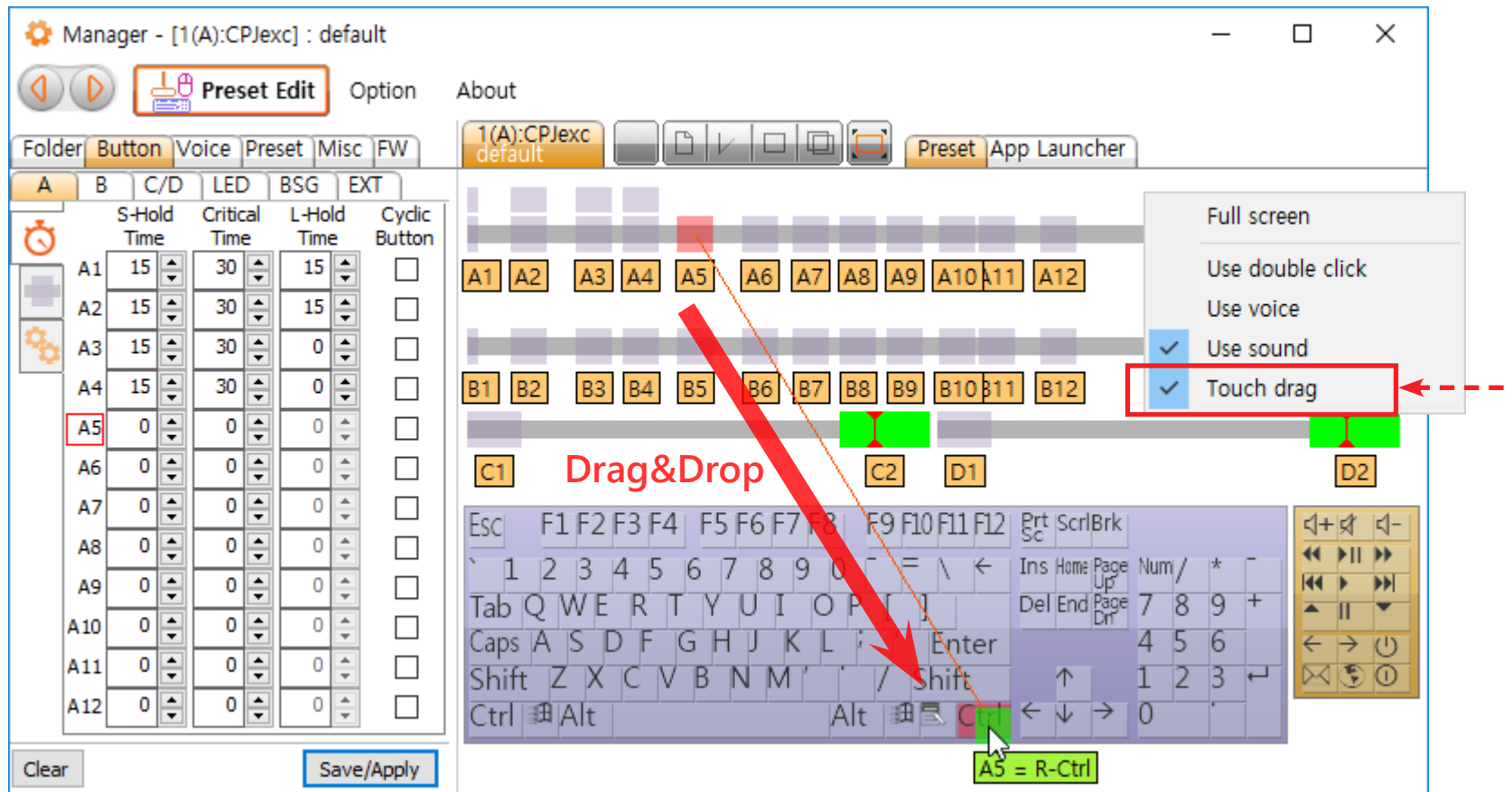
## 12. Preset Editing

### 12-1. Connecting a button to the hotkey

Drag&drop a Button Bar to the keyboard keys(or HID remote controller buttons). Up to 5 keys can be connected to one button.

Drag&drop sequence is same with the keyboard key stroke sequence.

For example, if you want a button to generate hotkey CTRL+ALT+DEL, drag-drop the Button Bar on the CTRL first, ALT next and DEL last.



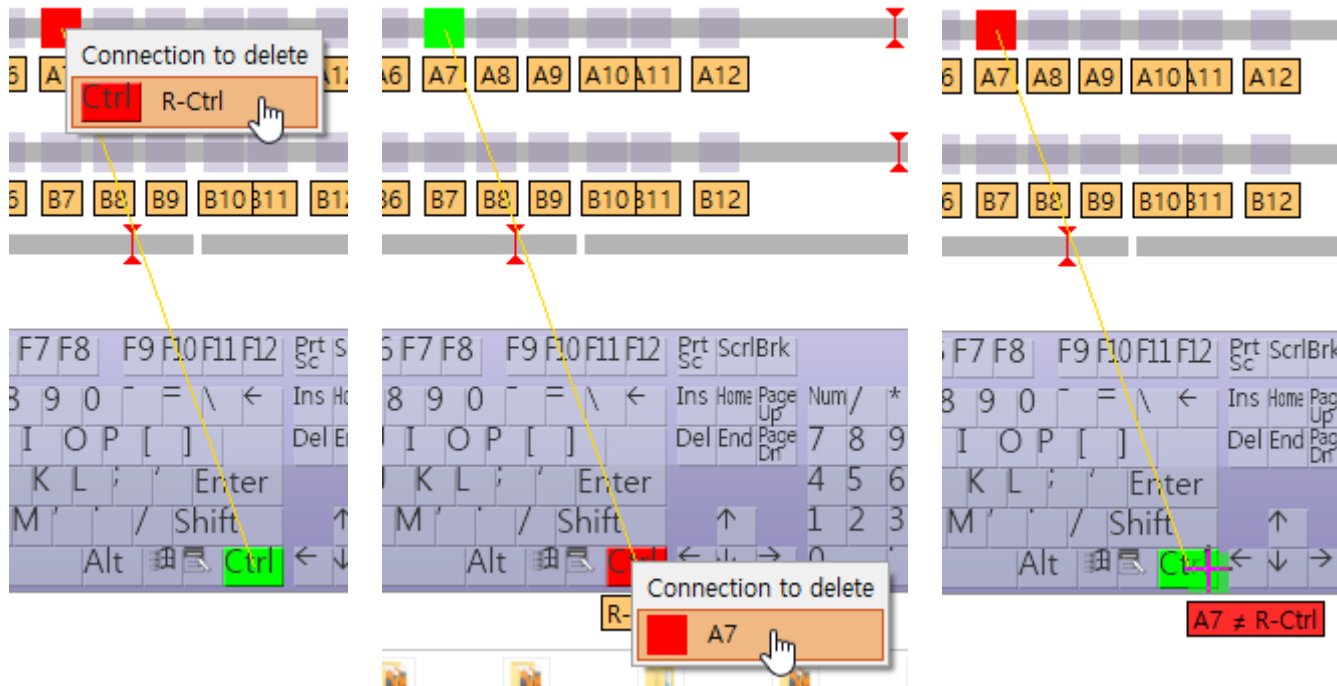
If **Touch drag** option is activated at the Context Menu, the Button Bar icon is attached to the mouse cursor by clicking it, and is dropped by another clicking on the keyboard key(or HID remote controller buttons).



## 12-2. Disconnecting a buttons from the Hotkey

Right-click the Button Bar or keyboard key(or HID remote controller button) and click an item in the drop down menu.

Or drag and drop the Button Bar to the connected keyboard key(or HID remote controller button) again.



### 12-3. Save / Restore Preset File

The hotkeys and configuration can be saved as a preset file(.prs) by Save(Save As) button.  
The hotkeys and configuration can be restored by Open Preset button or by double-clicking a preset file(.prs) or by drag-drop of a preset file(.prs) to the preset edit view.  
Resistor range and position of the buttons and the CAN IBUS settings are stored in the onboard memory of CPJexc.

The screenshot displays the 'Manager - [1(A):CPJexc] : default\*' application window. The 'Preset Edit' tab is active, showing a toolbar with icons for 'Save As', 'Save', 'Open Preset', 'New Preset', and 'Clear'. Below the toolbar is a table of button configurations:

Button	S-Hold Time	Critical Time	L-Hold Time	Cyclic Button
A1	15	30	15	<input type="checkbox"/>
A2	15	30	15	<input type="checkbox"/>
A3	15	30	0	<input type="checkbox"/>
A4	15	30	0	<input type="checkbox"/>
A5	0	0	0	<input type="checkbox"/>
A6	0	0	0	<input type="checkbox"/>
A7	0	0	0	<input type="checkbox"/>
A8	0	0	0	<input type="checkbox"/>
A9	0	0	0	<input type="checkbox"/>
A10	0	0	0	<input type="checkbox"/>
A11	0	0	0	<input type="checkbox"/>
A12	0	0	0	<input type="checkbox"/>

At the bottom of the window, a keyboard layout is visible. A red arrow points to the 'Media Player' icon on the taskbar, with the text 'Drag&Drop' written in red above it.

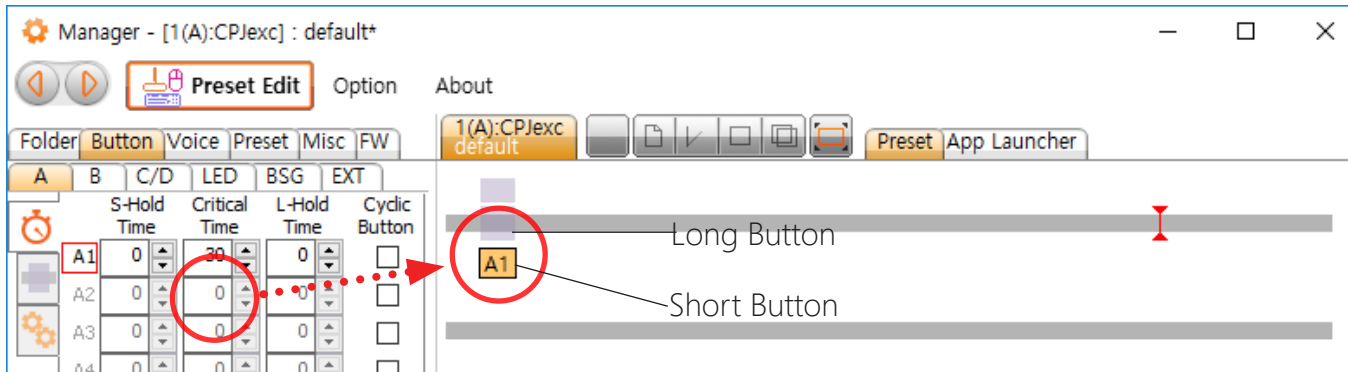
## 12-4. What is Short Button and Long Button

CPJexc supports two separated functions for one steering wheel remote control button.

The two functions are Short Button and Long Button.

Short Button is generated when the remote control button is pressed or released before **Critical Time**. Long Button is generated when the remote control button is released after **Critical Time**.

To use Long Button, set the **Critical Time** over than 0, then Long Button Bar will appear above the Short Button bar.



## 12-5. Separating Short from Long button

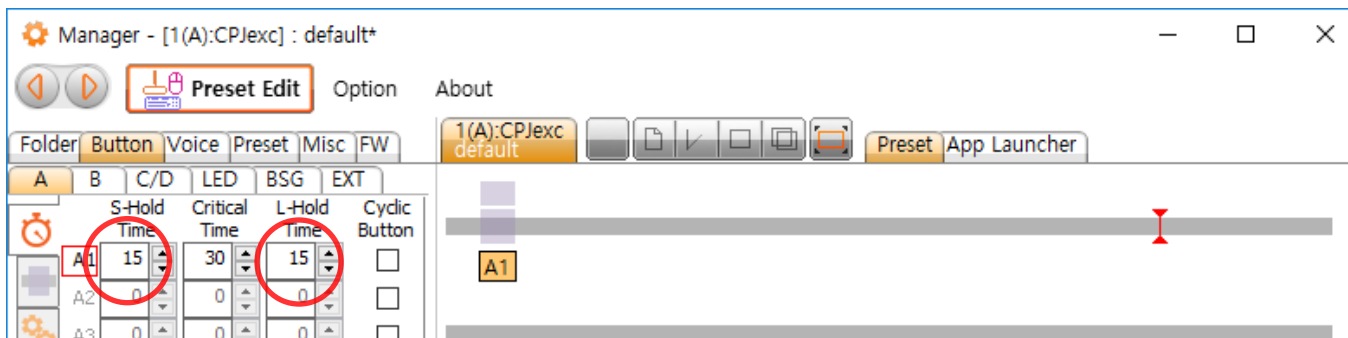
When you want to generate only the long button, the short button is required not to be generated immediately by pressing the remote control button.

Put 1~254 in **S-Hold Time**.

The short button is generated when the button is released before **Critical Time** while **S-Hold Time**.

The long button is generated when the button is released after **Critical Time** while **L-Hold Time**.

Hold Time value 1 is about 10ms, so Hold Time value 254 is about 2540ms(2.54s).



Hold Time 0 means that the button keeps being pressed while you keep pressing the remote control button. This is useful when you need to keep a key pressed in volume control.

(C, D channel support only Short Button and S-Hold Time.)

## 12-6. Toggle Button

If the **Hold Time** of a button is 255, the button is toggled.

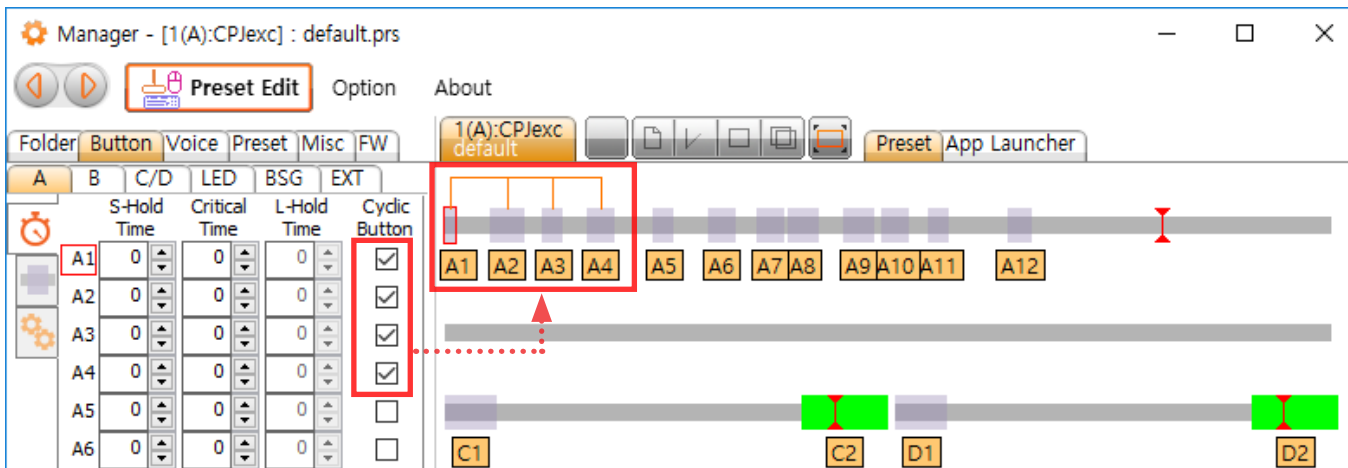
This is useful when a keyboard key need to be stroked while SHIFT, CTRL, or ALT keys are kept pressed. (For example, ALT+TAB or Window+TAB)



## 12-7. Cyclic Button

You can rotate the buttons by checking Cyclic Button. The cyclic buttons rotate by pressing any checked button.

For example in the next picture, when you press A1(or A2 or A3 or A4), button works A1->A2->A3->A4->A1->A2....



## 12-8. Programmable LED control

CPJexc can control one onboard LED and 6 external LEDs.

If you want to control LED with the current preset, check on box **Control** in the LED tab. If **Control** is not checked, this preset doesn't control LED and LED keeps previous configuration.

If **Reverse** is checked, On Off is reversed.

If **Turn Off on Sleep** is checked, LED is turned off when the PC goes into sleep mode.

LED control has 8 modes.

0. **Always On** : LED is turned on always
1. **Always Off** : LED is turned off always
2. **On by a button** : LED is turned on while a button is pressed.
3. **Blink by a button** : LED blinks periodically while a button is pressed.
4. **Toggle by a button** : LED is turned on by pressing a button, and is turned off by another pressing the button.
5. **Toggle blink by a button** : LED blinks periodically by pressing a button, and is turned off by another pressing a button.
6. **On by a button, off after a period** : LED is turned on by pressing a button, and is turned off after a period automatically.
7. **On by any button, off after a period** : LED is turned on by pressing any button, and is turned off after a period automatically.

Unit of **Period** is millisecond. In the blink mode(3, 5), turning on is one period and turning off is another period. For example, if the **Period** is 500(ms), LED is turned on every 1 second(1000ms).

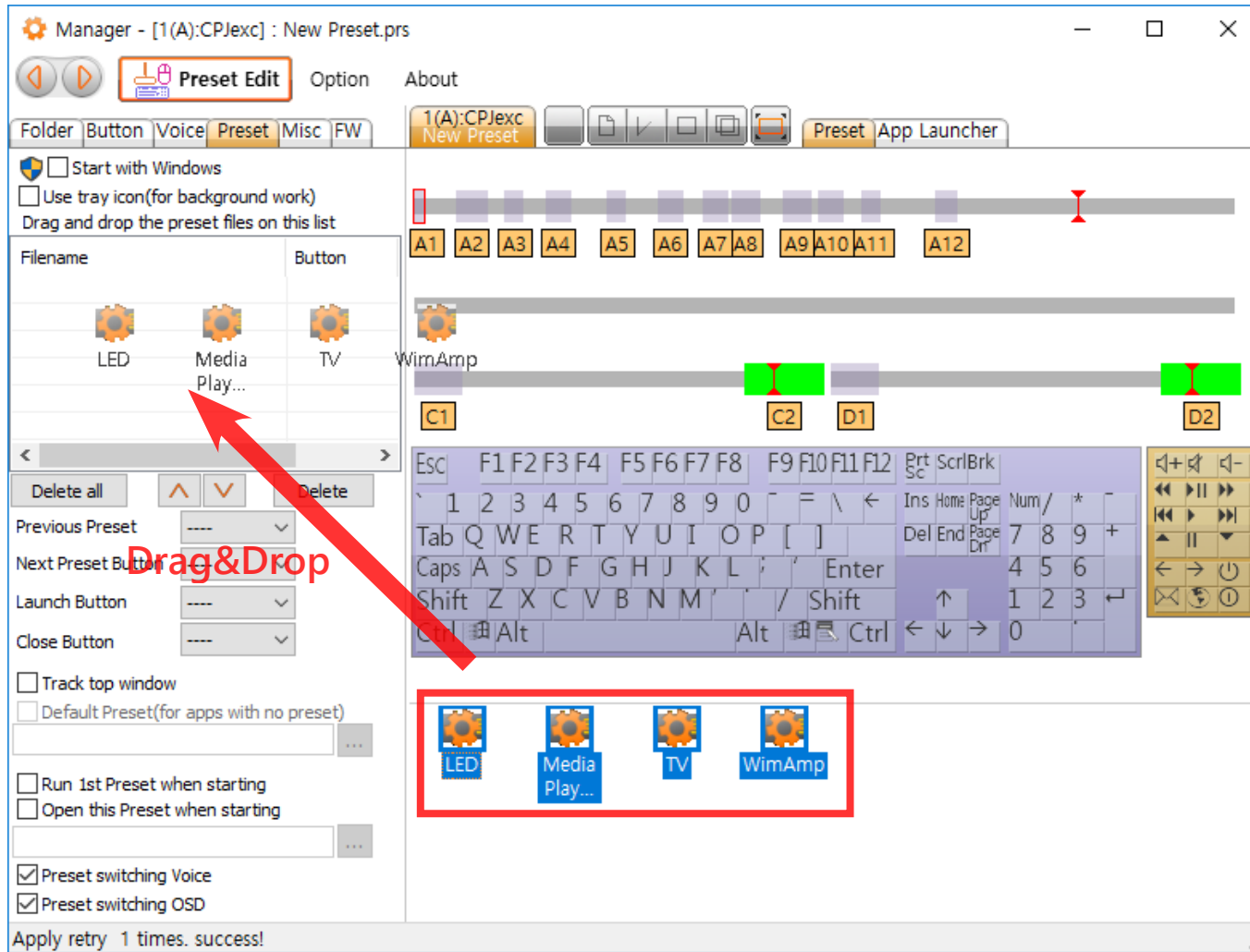
To assign a button to LED, drag-drop a button to a LED.

## 13. Preset Switching

A preset can be downloaded to CPJexc by Preset Button automatically, it is useful when you need to change steering wheel remote control's configuration while driving.

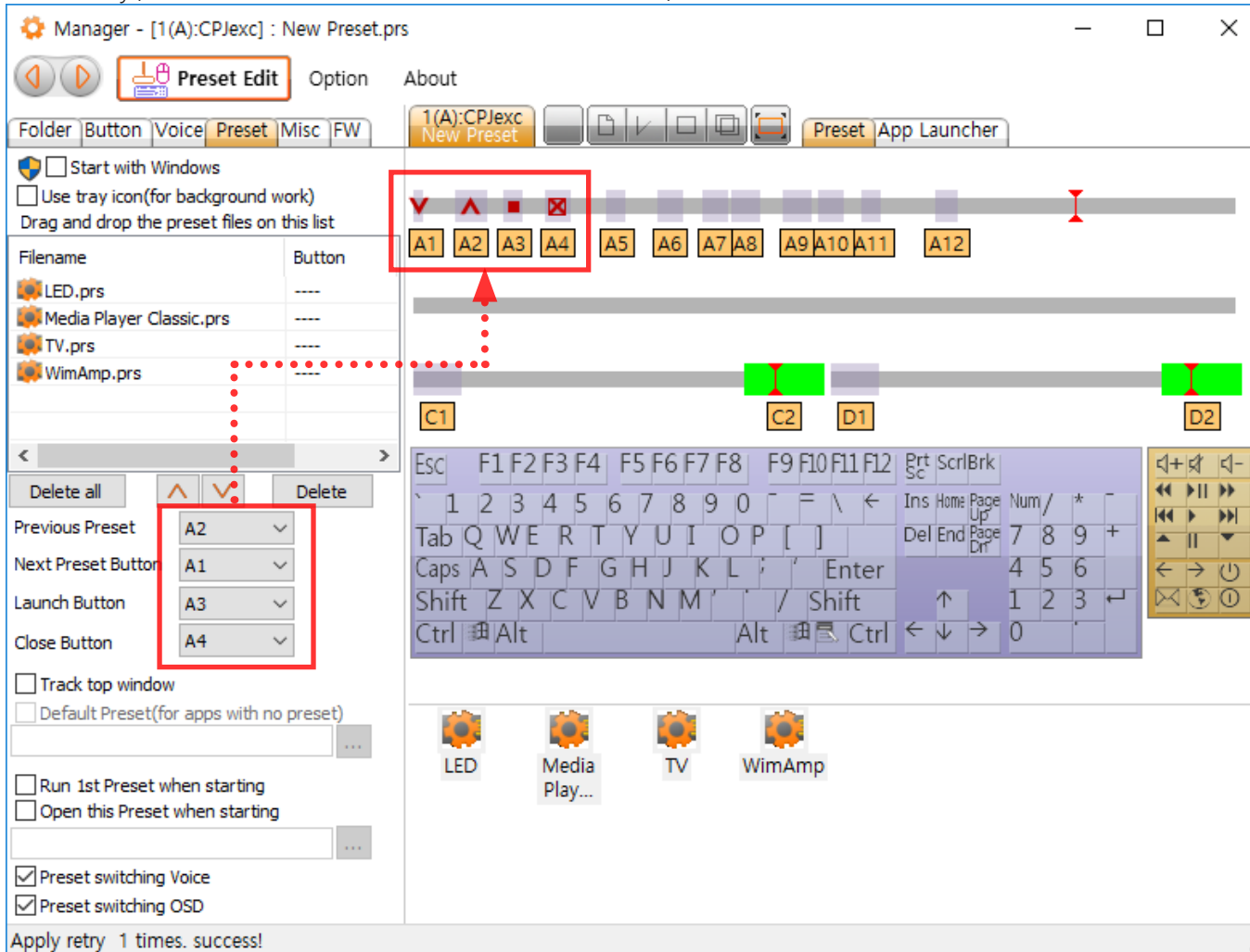
### 13-1. Preset List

Drag Drop preset files on the list of Preset tab. Preset is switched with the sequence of this list.

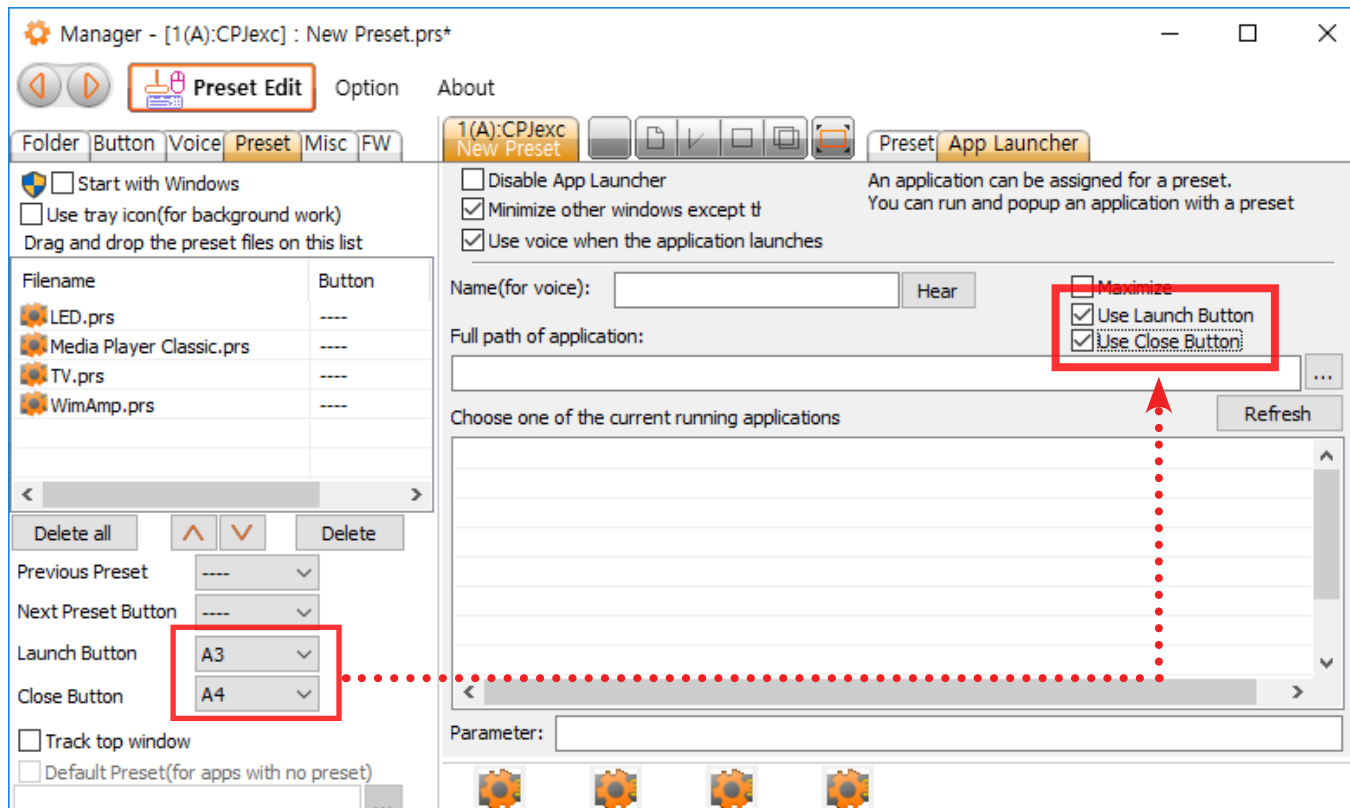


## 13-2. Preset Button

The presets are switched in sequence by **Previous Preset Button/Next Preset Button**. An application which is associated with the current preset in Application Launcher is closed by **Close Button**, Launched by **Launch Button**. Configure the Preset Button of every preset file in the preset list in the same way(S-Hold Time, L-Hold Time and Critical Time).

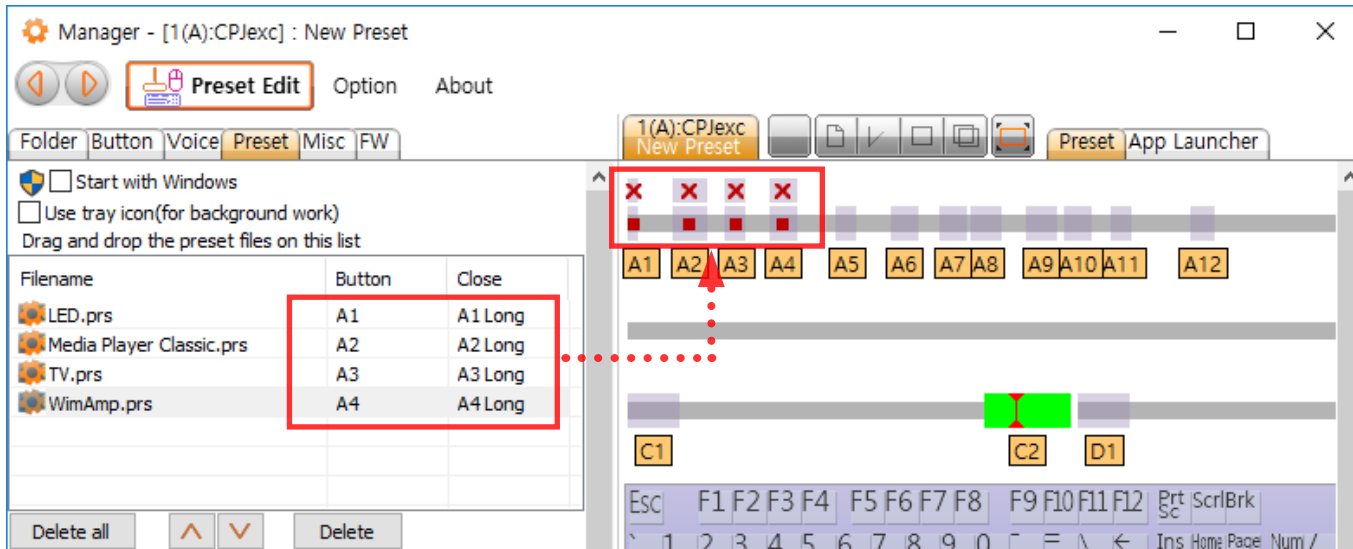


To use **Close Button** or **Launch Button**, check **Use Launch Button** or **Use Close Button** at Application Launcher for each preset file.



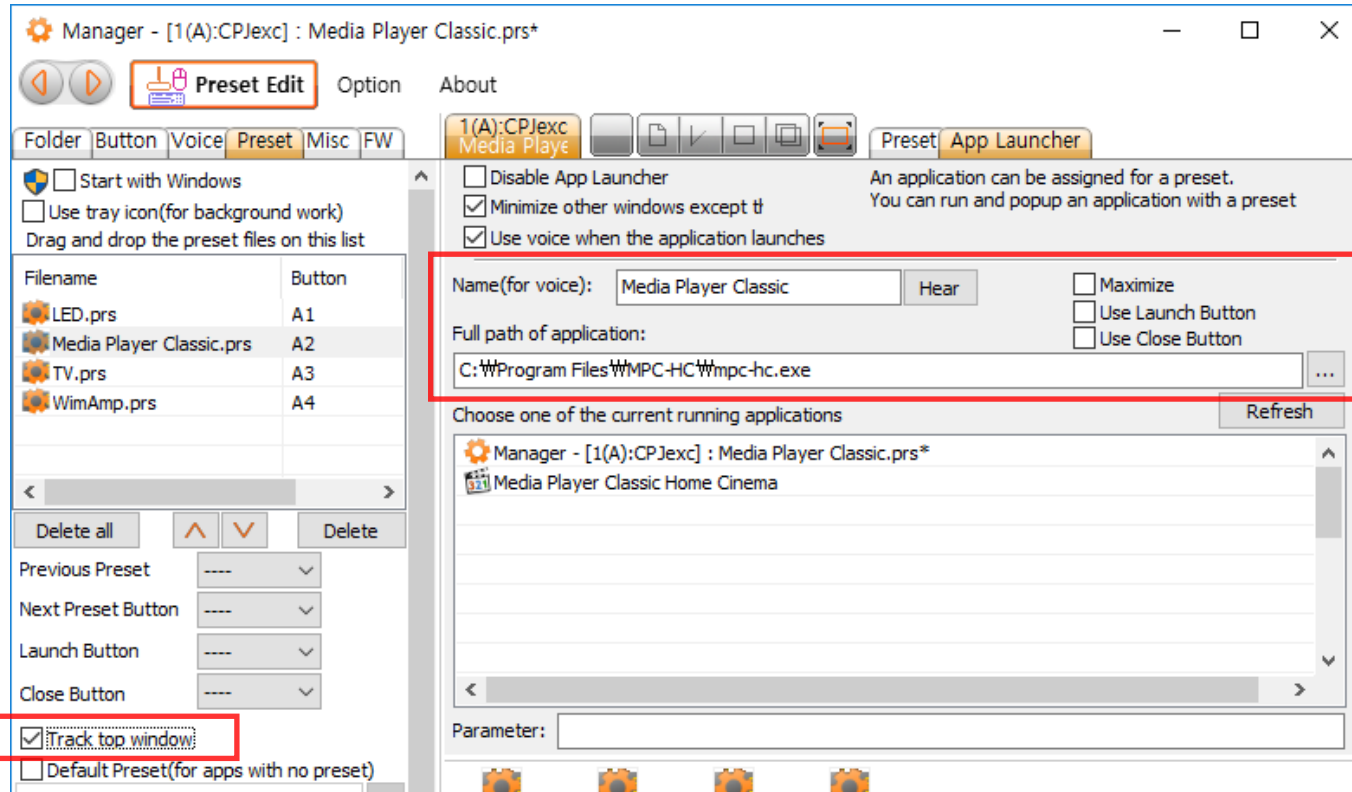


There is another way to switch the presets. You can switch a preset and launch an application directly not in sequence with **Preset Button** in the preset list. The application which is associated with the preset is closed by **Close Button** in the Preset List. Configure the Preset Button of every preset file in the preset list in the same way(S-Hold Time, L-Hold Time and Critical Time).



### 13-3. Application Launcher

An application can be launched and popped up when Preset is switched. Drag-drop (.exe) file(or shortcut file) or double-click current running application in the list box. **Name** is spoken when the application is launching. If the application is not running, the application is launched. If the application is already running, the application pops up. If the **Track top window** is checked, Preset is automatically switched by the top window.

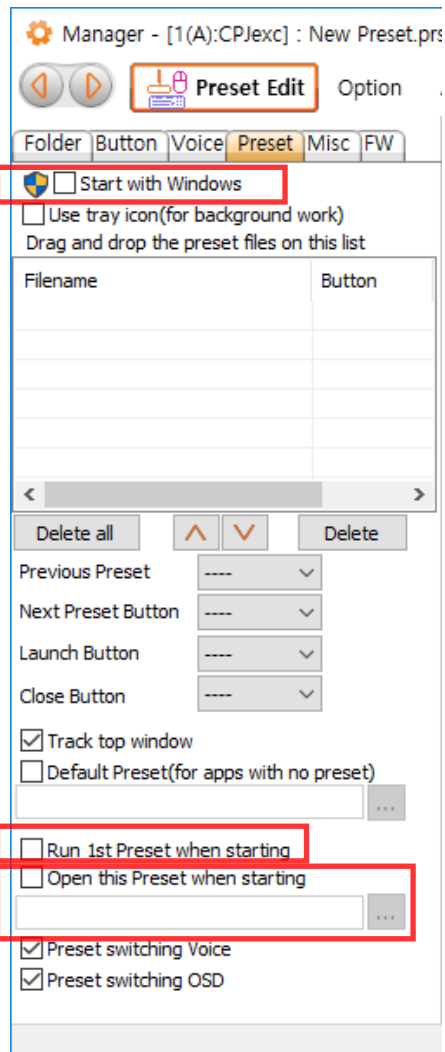


### 13-4. Start option

Check **Start with Windows** to run Manager when Windows starts.

Check **1st Preset when Starting** to run the first preset in the preset list when Manager starts. "Run Preset" means to launch or pop up an application with opening an preset).

Check **Open this Preset when Starting** and drag-drop a preset on the edit box, this preset is opened and applied to CPJexc when Manager starts.



## 14. BSG(Button Signal Generator) for BMW IBUS

BSG(Button Signal Generator) emulates the button signal that controls the car radio.

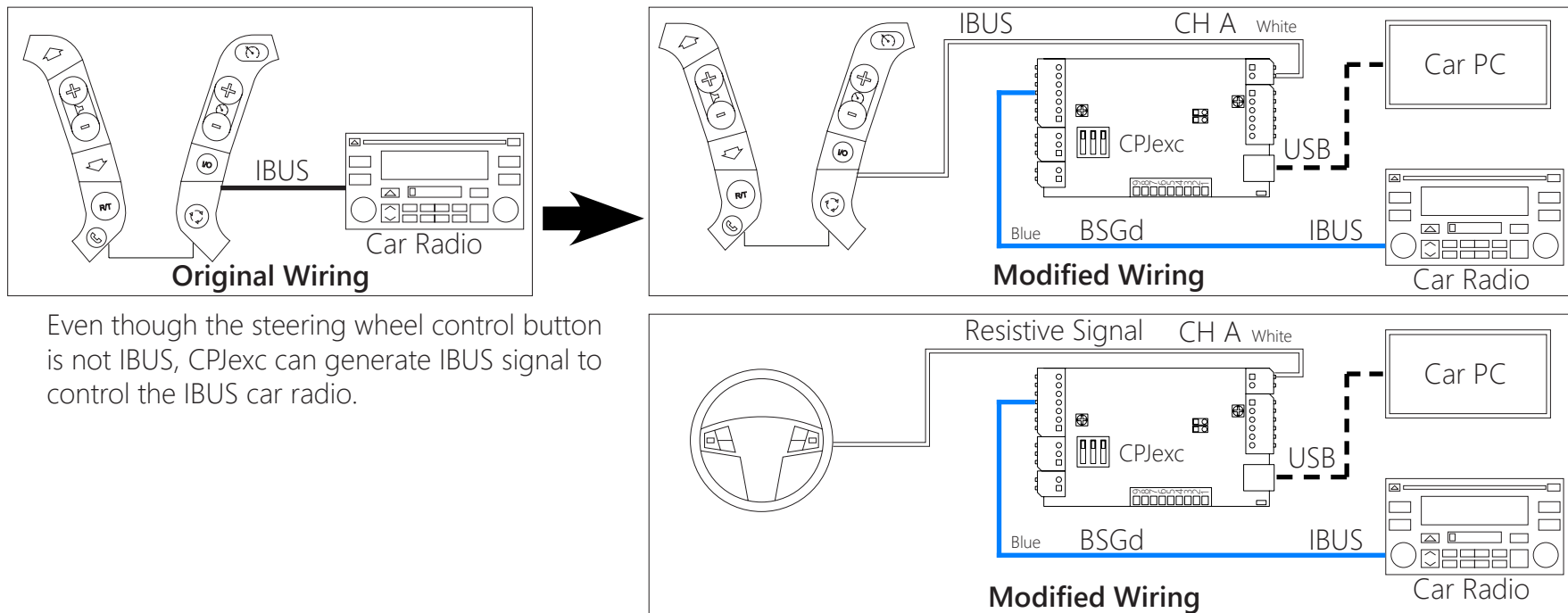
CPJexc itself supports BMW IBUS, AUDI '99-'04(LIN) and VW(Volkswagen) '99-'04(LIN) through BSGd(4th pin at 7Pin Power Connector).

You can control both car PC and BMW stereo with the steering wheel controls using BSGd.

### 14-1. Wiring of BSGd for BMW IBUS

Steering wheel controller's IBUS wire -> Channel A data wire of CPJexc

BSGd wire -> IBUS wire of car radio(or original equipment)



Even though the steering wheel control button is not IBUS, CPJexc can generate IBUS signal to control the IBUS car radio.

## 14-2. Manager Setting of BSGd for BMW IBUS

Choose the **BSG** index.

Choose BMW IBUS at **Type**.

BSG Index

Manager - [1(A):CPJexc] : New Preset

Option

Folder Button Voice Preset Misc FW

A	B	C/D	LED	BSG	EXT
1	1	Down	Up	Name	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Phone

Type BMW IBUS

Clear Save/Apply

BSG[#1] Config [BSG IBUS]

Idle Message

Use

Increasing Data Index 0 Increment: -1

Mask Type  OR  AND  No Mask

Mask FF FF FF FF | FF FF FF FF

Minimum Message Interval(ms) 0

Bypass Steering Wheel Control to Car Radio

Bypass Car Radio to Steering Wheel Control

Master BSG Index Master

BSG[#1] Button 1 - IBUS Message [BSG IBUS]

Down:

Up:

Use Idle Message as Up Message

Increasing Data Index 0 Increment: -1

Mask Type  OR  AND  No Mask

Mask FF FF FF FF | FF FF FF FF

Show sent IBUS message

IBUS Message

Export or import the BSG settings as a file(.bsg).

Hard to type IBUS format string?  
Type any character and click Apply, then IBUS format string appears at the edit box.

Click Apply, to apply the changed configuration to CPJexc.

### 14-3. Idle Message

Idle Message is needed for some car equipment(car radio) to be activated. Idle message is sent on IBUS through BSGd periodically by Duration("Dur:").

#### 14-3-1. Using Idle Message

Check on "Use", and put an IBUS message in the edit box(Drag&Drop or Copy&Paste)

"Dur:" is the interval of Idle Message.

"Dur:1" is 10ms. "Dur:100" is 1000ms, 1sec.

For example,

if the idle message is

Dur:100 Len: 4 sID:01 dID:50 Data:AB CD

the message is sent every 1 second to the Radio though BSGd.

#### 14-3-2. Increasing Data of Idle Message

Increasing Data is needed for some car equipment.

The Idle Message data indicated by **Increasing Data Index** is increased by **Increment** every time the Idle Message is sent.

**Increment** can be -128 ~ 127.

If Increasing Data is not used, set 0 at **Increasing Data Index**.

#### Example:

Idle message is

Dur:100 Len: 4 sID:01 dID:50 Data:AB CD

**Increasing Data Index** is 2

**Increment** is 1.

The data is sent like below every 1 second to the Radio though BSGd.

Len: 4 sID:1 dID:50 Data:AB 16

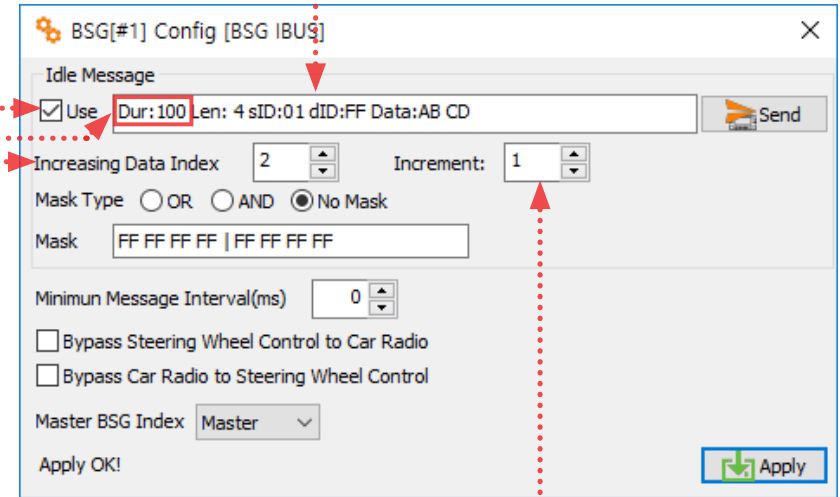
Len: 4 sID:1 dID:50 Data:AB 17

Len: 4 sID:1 dID:50 Data:AB 18

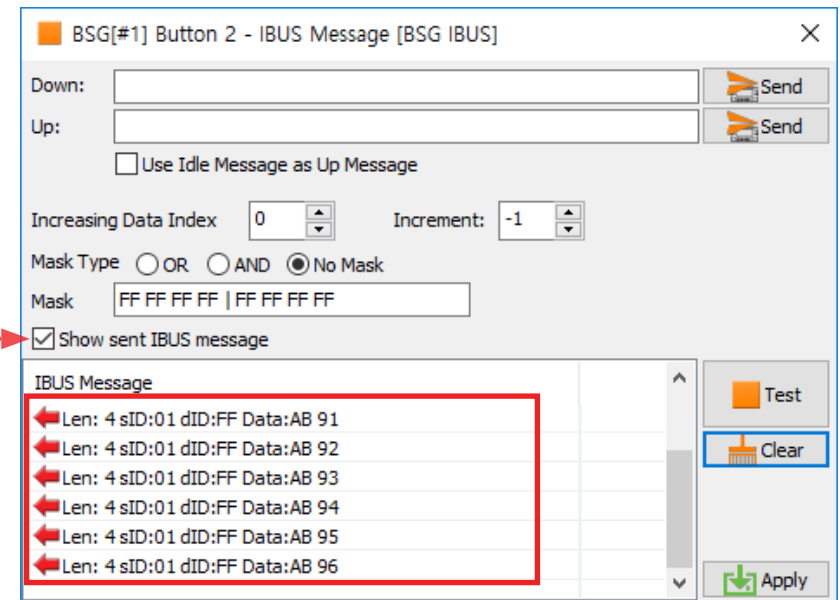
Len: 4 sID:1 dID:50 Data:AB 19

Len: 4 sID:1 dID:50 Data:AB 1A

....



You can see the sent Idle Message at Button Property with checking **Show sent IBUS message**.



### 14-3-3. Mask of Idle Message

Increasing Data need to be limited for some car car radio(or equipment).

To send the Increasing Data 0~0Fh, the higher bit need to be ANDed with 0x0F.

To send the Increasing Data F0h~FFh, the higher bit need to be ORed with 0xF0.

#### Example:

Idle Message is

Dur:100 Len: 4 sID:01 dID:50 Data:AB CD

**Increasing Data Index** is 2

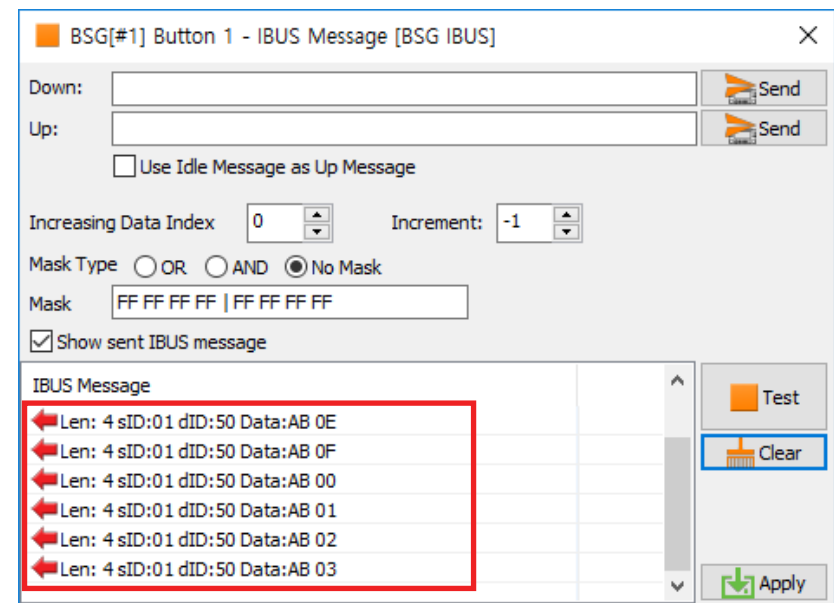
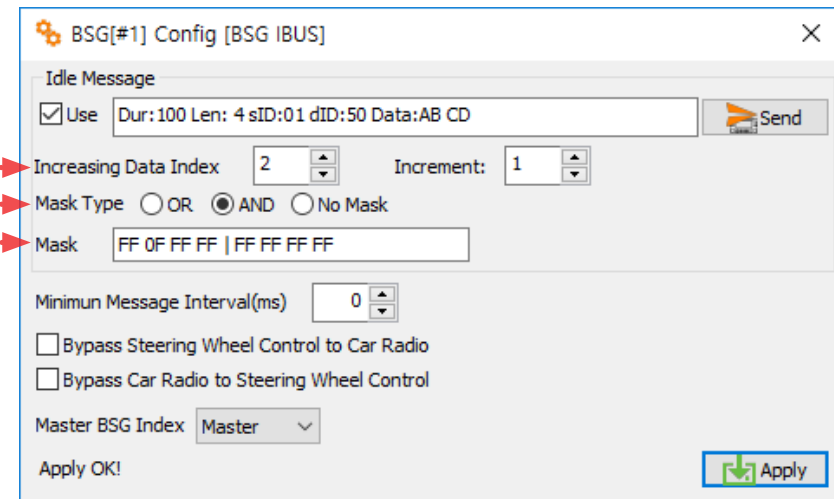
**Increment** is 1

**Mask Type** is "AND"

**Mask** is "FF 0F FF FF | FF FF FF FF"

The messages are sent every 1 second to the Radio though BSGd like below.

- S Len: 4 sID:01 dID:50 Data:AB 0B
- S Len: 4 sID:01 dID:50 Data:AB 0C
- S Len: 4 sID:01 dID:50 Data:AB 0D
- S Len: 4 sID:01 dID:50 Data:AB 0E
- S Len: 4 sID:01 dID:50 Data:AB 0F
- S Len: 4 sID:01 dID:50 Data:AB 00
- S Len: 4 sID:01 dID:50 Data:AB 01
- S Len: 4 sID:01 dID:50 Data:AB 02
- ....



#### 14-4. Extension of BSG Index

One BSG IBUS has 12 buttons.

If you need more than 12 buttons' IBUS output for car radio(or original equipment) though BSGd, you can use another BSG index as slave BSG IBUS.

The IBUS messages of the slave BSG IBUS are outputted through BSGd on the CPJexc.

If this BSG module is the master BSG module, choose "Master".

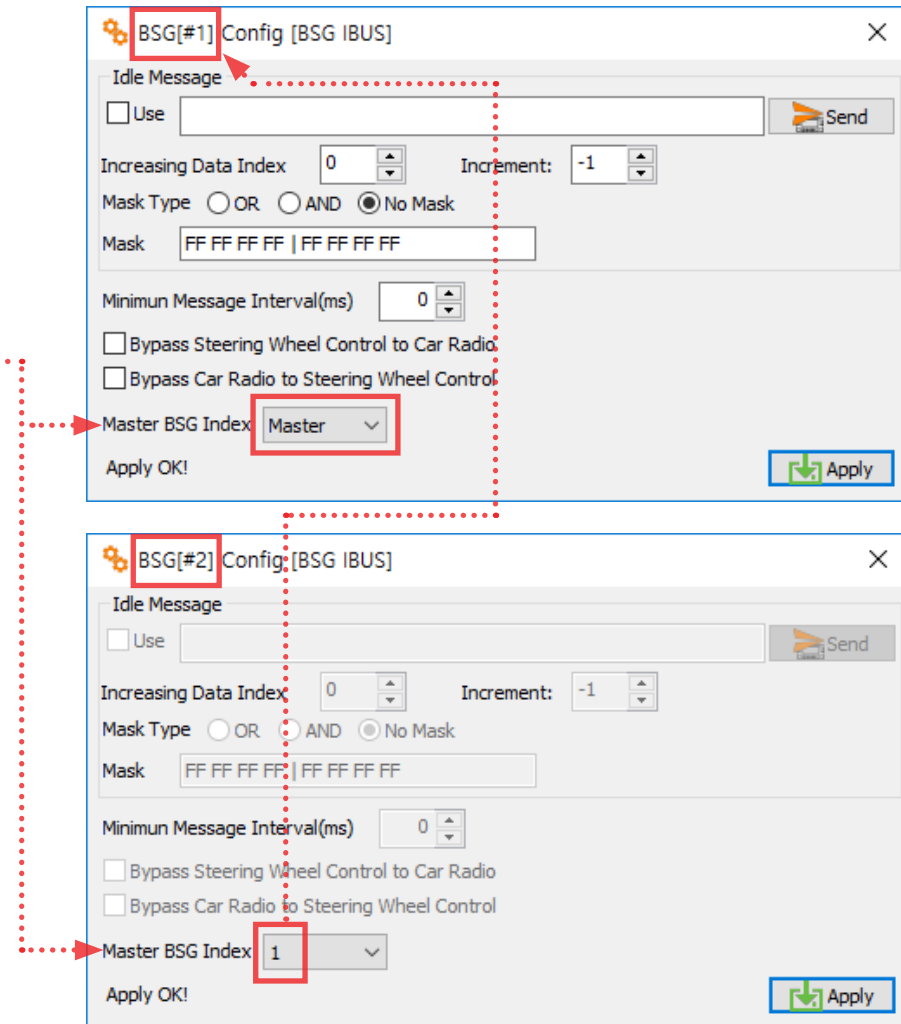
If this BSG module is the extension of the other BSG, choose the master BSG index of this BSG module at **Master BSG Index**.

For example,

If **Master BSG Index** is 1, this BSG index works as a part of the BSG index 1.

Even though both BSG index 1 and 2 are all Master, IBUS message is sent normally.

The reason of putting **Master BSG Index** is to share the Idle Message of Master BSG index.





## 14-5. BSG Button Configuration

### 14-5-1. BSG Button Message Configuration

BSG button is composed Up Button message and Down Button Message.

**Up Button** Message is sent through the BSGd when the steering wheel button is pressed.

**Down Button** Message is sent through the BSGd when the steering wheel button is released.

**Name** of BSG button is spoken when the Button is pressed.

Click the BSG Button, then Button Property pops up.

Type IBUS message format string in Button Property or Drag&Drop or Copy&Paste IBUS message from **CPJexc IBUS Scanner** to Button Property.

The image shows a multi-step configuration process in a software application:

- Button Message Table:** A table with columns 'Button Message', 'Button', and 'Bypass'. It lists two entries: 'A1 Down' and 'A1 Up', both with a duration of 0, length of 4, sID of 50, dID of 68, and data of 3B 01.
- Manager - [1(A):CPJexc] : New Preset.pr:** A window with tabs for 'Folder', 'Button', 'Voice', 'Preset', 'Misc', and 'FW'. The 'BSG' tab is active, showing a list of buttons (1-12) with columns for 'Down', 'Up', and 'Name'. A red arrow labeled 'Click' points to button 1.
- BSG[#1] Button 1 - IBUS Message [BSG IBUS]:** A configuration dialog for the selected button. It has fields for 'Down' and 'Up' messages (both 'Dur: 0 Len: 4 sID:50 dID:68 Data:3B 01'). It includes a 'Use Idle Message as Up Message' checkbox, 'Increasing Data Index' (0) and 'Increment' (-1) spinners, 'Mask Type' (OR, AND, No Mask), and a 'Mask' field ('FF FF FF FF | FF FF FF FF'). A 'Show sent IBUS message' checkbox is checked. Below it is a listbox showing four sent messages: '← Len: 4 sID:50 dID:68 Data:3B 01'. A 'Test' button is highlighted with a red box, and an 'Apply' button is also highlighted with a red box.

Red arrows and text indicate the workflow: 'Drag&Drop' from the 'Button Message' table to the 'Down' field, and 'Click' on button 1 in the 'Manager' window to open the configuration dialog. A text box at the bottom right states: "Test the configured BSG button with 'Test' Button, or clicking the button number."

If **Show sent IBUS message** is checked, the IBUS message sent on the IBUS are listed at the listbox.

### 14-5-2. Repeated Button

Some button repeats IBUS message while the button is being pressed.

"Dur:" is the interval of the repeated IBUS message. (Unit is 10ms.)

The Down Button Message is sent repeatedly while the button is being pressed.

#### Example:

BMW Volume+/- buttons repeat IBUS message every 100ms("Dur:10") while the volume button is being pressed.

Down Button Message is .....

Dur: 10 Len: 4 sID:50 dID:68 Data:32 11

While the button is being pressed, the messages are sent to the radio though BSGd every 100ms like below.

Len: 4 sID:50 dID:68 Data:32 11

Len: 4 sID:50 dID:68 Data:32 11

Len: 4 sID:50 dID:68 Data:32 11

Len: 4 sID:50 dID:68 Data:32 11

Len: 4 sID:50 dID:68 Data:32 11

....

BSG[#1] Button 1 - IBUS Message [BSG IBUS]

Down: Dur: 10 Len: 4 sID:50 dID:68 Data:32 11 Send

Up: Send

Use Idle Message as Up Message

Increasing Data Index 0 Increment: -1

Mask Type  OR  AND  No Mask

Mask FF FF FF FF | FF FF FF FF

Show sent IBUS message

IBUS Message
← Len: 4 sID:50 dID:68 Data:32 11
← Len: 4 sID:50 dID:68 Data:32 11
← Len: 4 sID:50 dID:68 Data:32 11
← Len: 4 sID:50 dID:68 Data:32 11
← Len: 4 sID:50 dID:68 Data:32 11

Test

Clear

Apply

### 14-5-3. Increasing Data of Button Message

In some vehicle, a data of the Button Message needs to be increased every time it is sent.

The Button Message data indicated by **Increasing Data Index** is increased by **Increment** every time the Button Message is sent.

**Increment** can be -128 ~ 127.

If Increasing Data is not used, set 0 at **Increasing Data Index**.

#### Example:

Down Message is

Dur: 0 Len: 4 sID:50 dID:68 Data:3B 08

Up Message is

Dur: 0 Len: 4 sID:50 dID:68 Data:3B 28

**Increasing Data Index** is 1

**Increment** is 1

When the button is pressed and released, the messages are sent to the radio though BSGd like below.

Len: 4 sID:50 dID:68 Data:03 08

Len: 4 sID:50 dID:68 Data:04 28

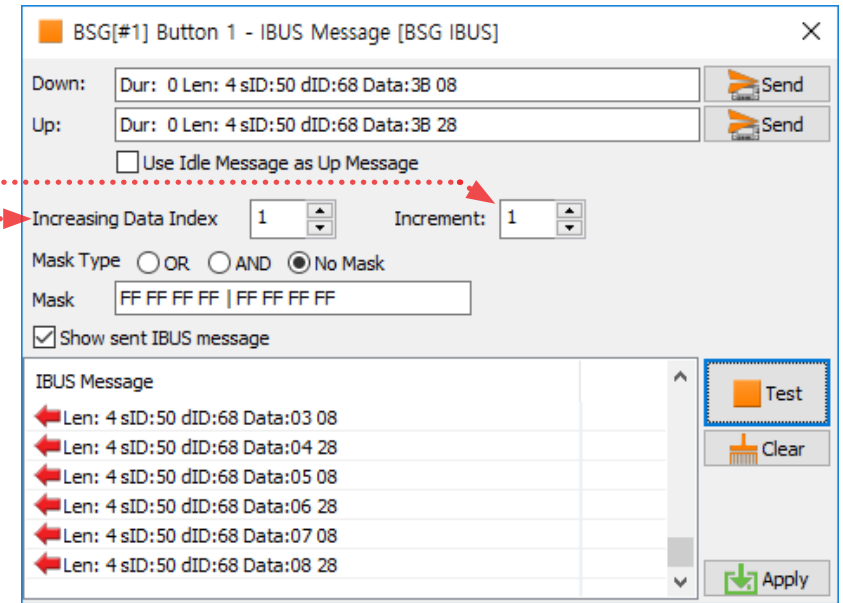
Len: 4 sID:50 dID:68 Data:05 08

Len: 4 sID:50 dID:68 Data:06 28

Len: 4 sID:50 dID:68 Data:07 08

Len: 4 sID:50 dID:68 Data:08 28

....



### 14-5-4. Mask of Button Message

In some vehicle, Increasing Data need to be limited for some car equipment.

To send the Increasing Data 0~0Fh, the higher bit need to be ANDed with 0x0F.

To send the Increasing Data F0h~FFh, the higher bit need to be ORed with 0xF0.

#### Example:

Down Button Message is

Dur: 0 Len: 4 sID:50 dID:68 Data:3B 08

Up Button Message is

Dur: 0 Len: 4 sID:50 dID:68 Data:3B 28

**Increasing Data Index** is 1

**Increment** is 1

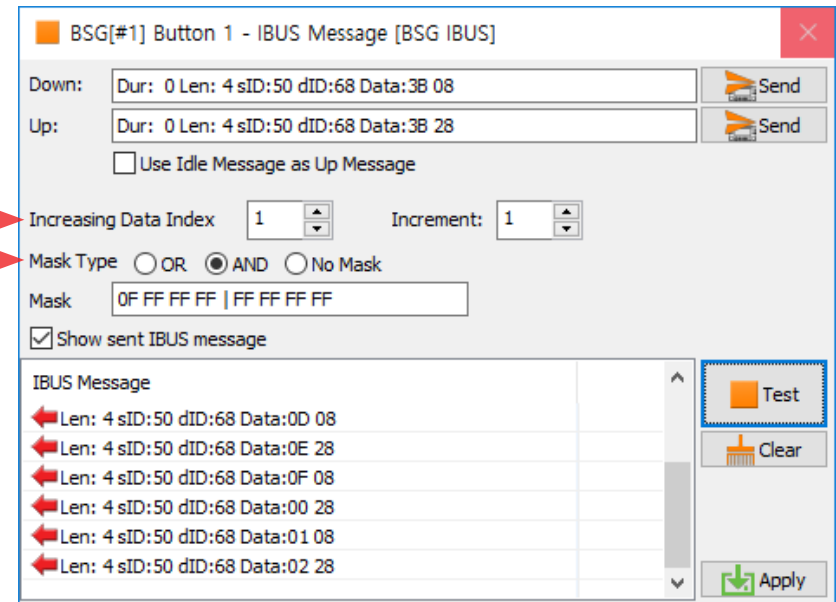
**Mask Type** is "AND"

**Mask** is "0F FF FF FF | FF FF FF FF"

When the button is pressed and released, the messages are sent to the radio though BSGd like below.

Len: 4 sID:50 dID:68 Data:09 28  
 Len: 4 sID:50 dID:68 Data:0A 08  
 Len: 4 sID:50 dID:68 Data:0B 28  
 Len: 4 sID:50 dID:68 Data:0C 08  
 Len: 4 sID:50 dID:68 Data:0D 28  
 Len: 4 sID:50 dID:68 Data:0E 08  
 Len: 4 sID:50 dID:68 Data:0F 28  
 Len: 4 sID:50 dID:68 Data:00 08  
 Len: 4 sID:50 dID:68 Data:01 28  
 Len: 4 sID:50 dID:68 Data:02 08  
 Len: 4 sID:50 dID:68 Data:03 28  
 Len: 4 sID:50 dID:68 Data:04 08

....



## 14-5-5. Using Idle Message as Up Message

### 14-5-5-1. Common Up Button Message

Some steering wheel control button use common Up Button Message. You can use this option for the buttons to have common Up Button Message.

#### Example:

**Idle Message** is  
Dur:0 Len: 4 sID:01 dID:50 Data:AB 00

**Down Button Message** is  
Dur: 0 Len: 4 sID:50 dID:68 Data:3B 08

Check on **Use Idle Message as Up Message**

When the button is pressed and released, the messages are sent to the radio though BSGd like below.

Len: 4 sID:50 dID:68 Data:0B 08

Len: 4 sID:50 dID:68 Data:AB 00

Len: 4 sID:50 dID:68 Data:0B 08

Len: 4 sID:50 dID:68 Data:AB 00

....

BSG[#1] Config [BSG IBUS]

Idle Message

Use Dur: 0 Len: 4 sID:50 dID:68 Data:AB 00 Send

Increasing Data Index: 0 Increment: -1

Mask Type:  OR  AND  No Mask

Mask: FF FF FF FF | FF FF FF FF

Minimum Message Interval(ms): 0

Bypass Steering Wheel Control to Car Radio

Bypass Car Radio to Steering Wheel Control

Master BSG Index: Master

Apply OK! Apply

BSG[#1] Button 1 - IBUS Message [BSG IBUS]

Down: Dur: 0 Len: 4 sID:50 dID:68 Data:3B 08 Send

Up: Send

Use Idle Message as Up Message

Increasing Data Index: 0 Increment: -1

Mask Type:  OR  AND  No Mask

Mask: FF FF FF FF | FF FF FF FF

Show sent IBUS message

IBUS Message

← Len: 4 sID:50 dID:68 Data:3B 08
← Len: 4 sID:50 dID:68 Data:AB 00
← Len: 4 sID:50 dID:68 Data:3B 08
← Len: 4 sID:50 dID:68 Data:AB 00

Test Clear Apply

### 14-5-5-2. Common Increasing Data

Some steering wheel control button needs common increasing data both at Down Button Message and Up Button Message.

This option is used to give common increasing data both for Down and Up Button Messages.

#### Example:

**Idle Message** is

Dur: 0 Len: 4 sID:50 dID:68 Data:AB CD

**Down Button Message** is

Dur: 0 Len: 4 sID:50 dID:68 Data:3B 08

Check on **Use Idle Message as Up Message**

When the button is pressed and released, the messages are sent to the radio though BSGd like below.

Len: 4 sID:50 dID:68 Data:33 08  
 Len: 4 sID:50 dID:68 Data:34 CD  
 Len: 4 sID:50 dID:68 Data:35 08  
 Len: 4 sID:50 dID:68 Data:36 CD  
 Len: 4 sID:50 dID:68 Data:37 08  
 Len: 4 sID:50 dID:68 Data:38 CD  
 ....

BSG[#1] Config [BSG IBUS]

Idle Message

Use Dur: 0 Len: 4 sID:50 dID:68 Data:AB CD Send

Increasing Data Index: 1 Increment: 1

Mask Type:  OR  AND  No Mask

Mask: FF FF FF FF | FF FF FF FF

Minimum Message Interval(ms): 0

Bypass Steering Wheel Control to Car Radio

Bypass Car Radio to Steering Wheel Control

Master BSG Index: Master

Apply OK! Apply

BSG[#1] Button 1 - IBUS Message [BSG IBUS]

Down: Dur: 0 Len: 4 sID:50 dID:68 Data:3B 08 Send

Up: Send

Use Idle Message as Up Message

Increasing Data Index: 0 Increment: -1

Mask Type:  OR  AND  No Mask

Mask: FF FF FF FF | FF FF FF FF

Show sent IBUS message

IBUS Message

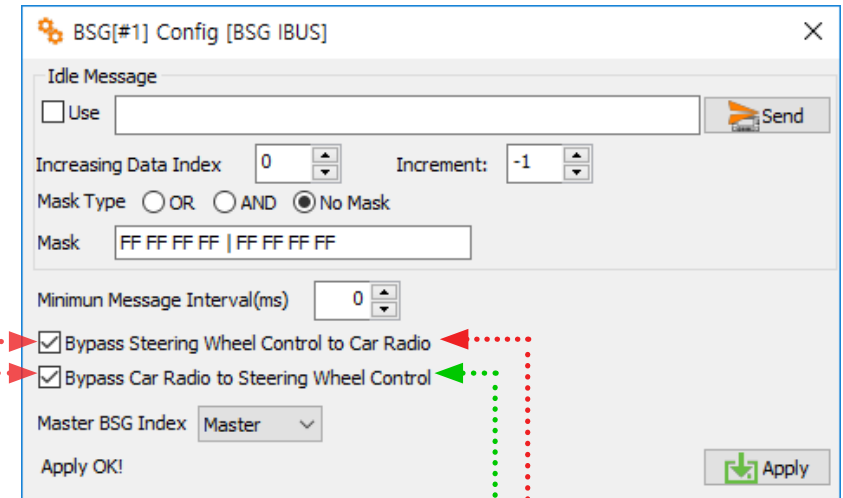
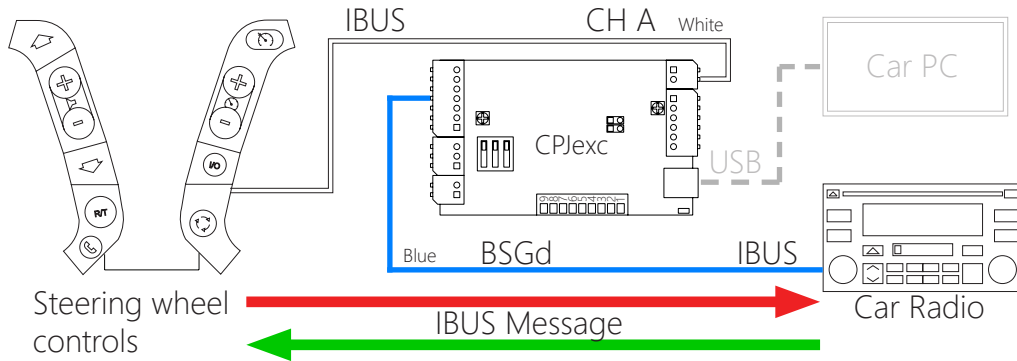
- Len: 4 sID:50 dID:68 Data:34 08
- Len: 4 sID:50 dID:68 Data:35 CD
- Len: 4 sID:50 dID:68 Data:36 08
- Len: 4 sID:50 dID:68 Data:37 CD
- Len: 4 sID:50 dID:68 Data:38 08
- Len: 4 sID:50 dID:68 Data:39 CD

Test Clear Apply

### 14-6. Bypass of IBUS Message

If not all of the steering wheel control buttons are used for the car PC, you may want some button still work for the car radio.

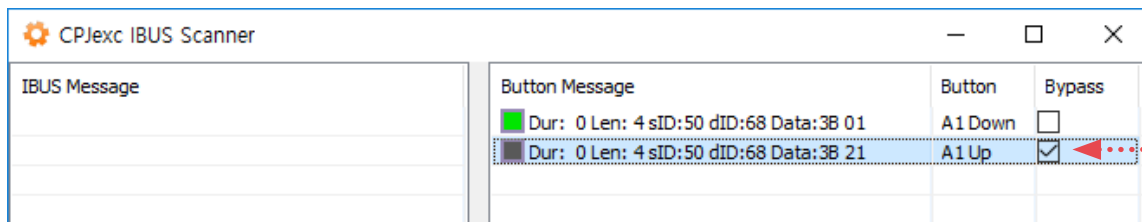
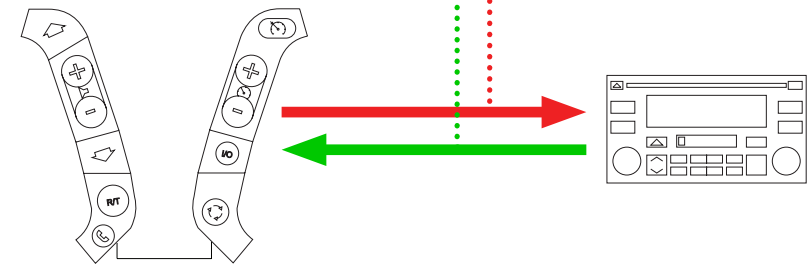
Because CPJexc is wired between the steering wheel control and the car radio, CPJexc need to bypass the messages which are used for original equipment(car radio).



If **Bypass Steering Wheel Controls to Head Unit** is checked, CPJexc bypasses all the messages originate from the steering wheel controls except the messages used as a button message.

If you want to bypass the button message from steering wheel control to the car radio, check **Bypass** at the button message list in IBUS Scanner. Usually the Up Button Message need to bypass to the car radio.

If **Bypass Head Unit to Steering Wheel Controls** is checked, CPJexc bypasses all the messages originate from the head unit.



## 14-7. Connecting Steering wheel button to BSG button

Drag&Drop a button to the BSG buttons to use steering wheel buttons for BSG Buttons. Then the BSG button works by the steering wheel control button.

This is same with connecting the steering wheel buttons to USB keyboard or HID remote controller.

The screenshot shows the 'Preset Edit' window in CPJexc. On the left, a table lists buttons and their functions:

A	B	C/D	LED	BSG	EXT	Name
1	D:50 dID	D:50 dID				Next Track
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

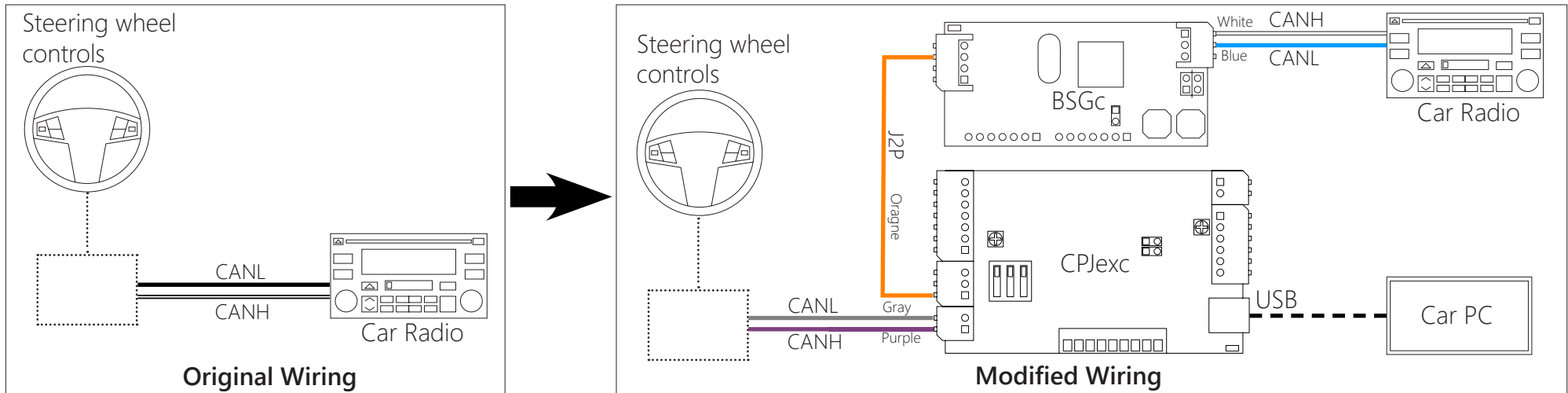
Below the table, the 'Type' is set to 'BMW IBUS'. A red arrow labeled 'Drag&Drop' points from button 'A1' in the table to button '1' in the 'BSG - BSG IBUS' section. The 'BSG - BSG IBUS' section shows 12 buttons, with button '1' highlighted in green and labeled 'A1 = Next Track'.



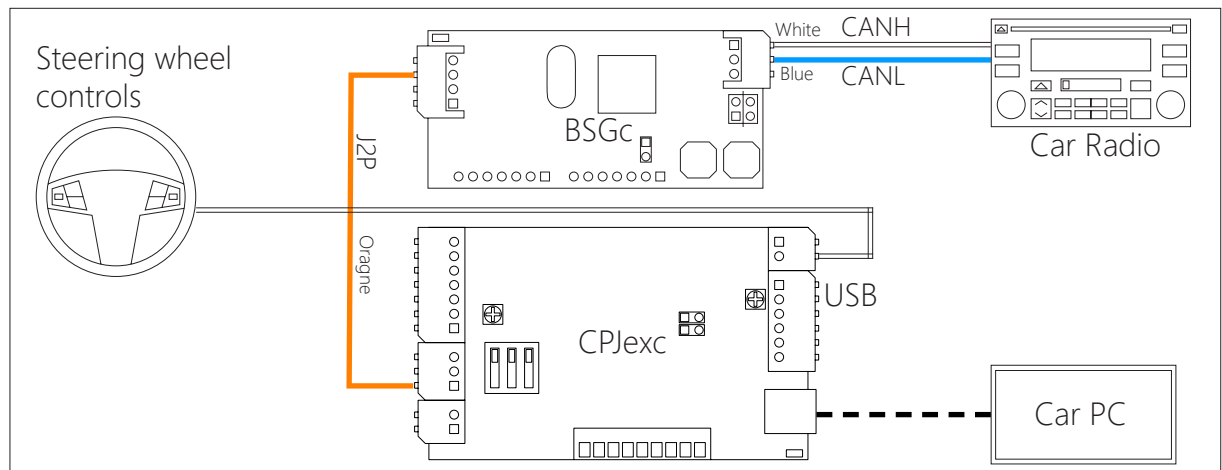
## 15. BSG (Button Signal Generator) for CAN BUS

BSGc(Button Signal Generator CAN) is an external devices connected through J2P BUS wire (J2P BUS is a signal wire that connects CPJexc and its peripherals.) You can control both car PC and car radio with steering wheel controls using BSGc.

### 15-1. Wiring of BSGc



Even though the steering wheel control button is not CAN BUS, CPJexc can generate CAN signal to control the CAN BUS radio with BSGc.



CPJexc firmware newer than 160228 does not supports old BSGc.  
 New BSGc supports online firmware update.  
 This user guide is described based on new BSGc.  
 If you have old BSGc, contact [www.exInterface.com](http://www.exInterface.com) to exchange it with a new one.

### 15-2. Manager Setting

Choose the **BSG** index.  
 Choose BSGc at **Type**.  
 Set baudrate.

If BSGc is connected properly, the version appears.  
 If "No J2P Device at #n" appears, check J2P wiring or BSGc is powered.  
 This is supported from the new BSGc that supports firmware update.

BSG Index

The screenshot shows the 'Manager - [1(A):CPJexc] : New Preset.pr' window. At the top, there are navigation buttons and a 'Preset Edit' button. Below that are tabs for 'Folder', 'Button', 'Voice', 'Preset', 'Misc', and 'FW'. A table with columns 'A', 'B', 'C/D', 'LED', 'BSG', and 'EXT' is visible. The 'BSG' column has sub-columns for 'Down' and 'Up'. Row 1 is selected, showing '1' in the 'A' column, '1' in the 'Down' sub-column, and 'Next Track' in the 'Name' column. Below the table, there are 'Phone' and 'Type' dropdown menus, with 'Type' set to 'BSGc(CAN)'. A gear icon and '100kbps' are also visible. 'Clear' and 'Save/Apply' buttons are at the bottom.

Export or import the BSG settings as a file(.bsg).

Hard to type CAN format string?  
 Type any character and click Apply, then CAN format string appears at the edit box.

The 'BSG[#1] Config [BSG CAN] - 100kbps' dialog box is shown. The 'Baudrate(kbps)' dropdown is set to '100' and is highlighted with a red box. The 'Ver.' field shows '170328'. There is an 'Idle Message' section with a 'Use' checkbox and a 'Send' button. Below that are 'Increasing Data Index' (0) and 'Increment' (-1) fields. 'Mask Type' has radio buttons for 'OR', 'AND', and 'No Mask' (selected). A 'Mask' field contains 'FF FF FF FF | FF FF FF FF'. There is a 'Minimun Message Interval(ms)' field set to '0'. Two checkboxes are present: 'Bypass Steering Wheel Control to Car Radio' and 'Bypass Car Radio to Steering Wheel Control'. A 'Master BSG Index' dropdown is set to 'Master'. There are 'ID Filter' and 'Apply' buttons at the bottom right.

The 'BSG[#1] Button 1 - CAN Message [BSG CAN] - 100kbps' dialog box is shown. It has 'Down:' and 'Up:' input fields, each with a 'Send' button. There is a 'Use Idle Message as Up Message' checkbox. Below are 'Increasing Data Index' (0) and 'Increment' (-1) fields. 'Mask Type' has radio buttons for 'OR', 'AND', and 'No Mask' (selected). A 'Mask' field contains 'FF FF FF FF | FF FF FF FF'. There is a 'Show how message is sent' checkbox. At the bottom, there is a 'CAN Message' table with several empty rows and 'Test', 'Clear', and 'Apply' buttons.

Click Apply, to apply the changed configuration to CPJexc.

### 15-3. Idle Message

Idle Message is needed for some car equipment(car radio) to be activated. Idle message is sent on CAN BUS periodically by Duration("Dur:").

#### 15-3-1. Using Idle Message

Check on box "Use", and put an CAN message in the edit box(Drag&Drop or Copy&Paste).

"Dur:" is the interval of Idle Message.

"Dur:1" is 10ms. "Dur:100" is 1000ms, 1sec.

For example,

if the idle message is

Dur:100 Len: 2 ID:0500 Data:12 34

the message is sent every 1 second to the Radio though BSGc.

#### 15-3-2. Increasing Data of Idle Message

Increasing Data is needed for some car equipment.

The Idle Message data indicated by **Increasing Data Index** is increased by **Increment** every time the Idle Message is sent.

**Increment** can be -128 ~ 127.

If Increasing Data is not used, set 0 at **Increasing Data Index**.

#### Example:

Idle message is

Dur:200 Len: 2 ID:0500 Data:00 00

**Increasing Data Index** is 2

**Increment** is 1.

The data is sent like below every 1 second to car radio though BSGc.

S Len: 2 ID:0500 Data:00 18

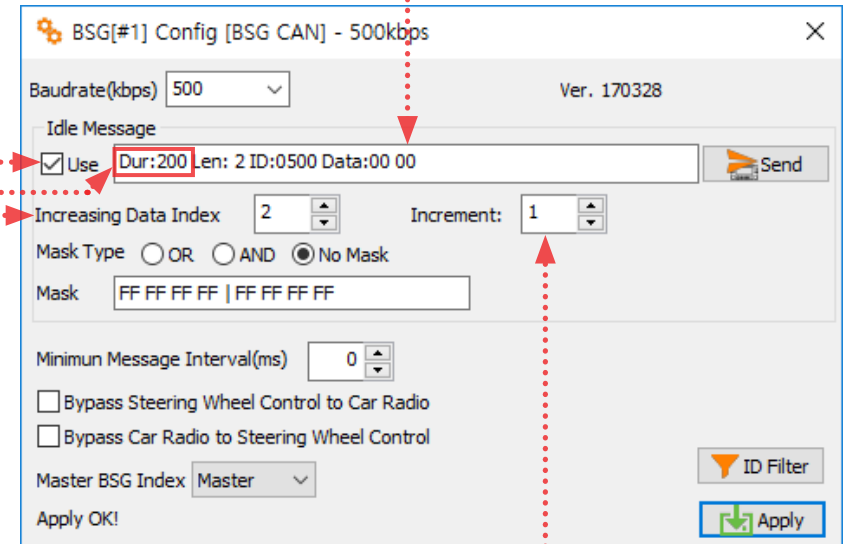
S Len: 2 ID:0500 Data:00 19

S Len: 2 ID:0500 Data:00 1A

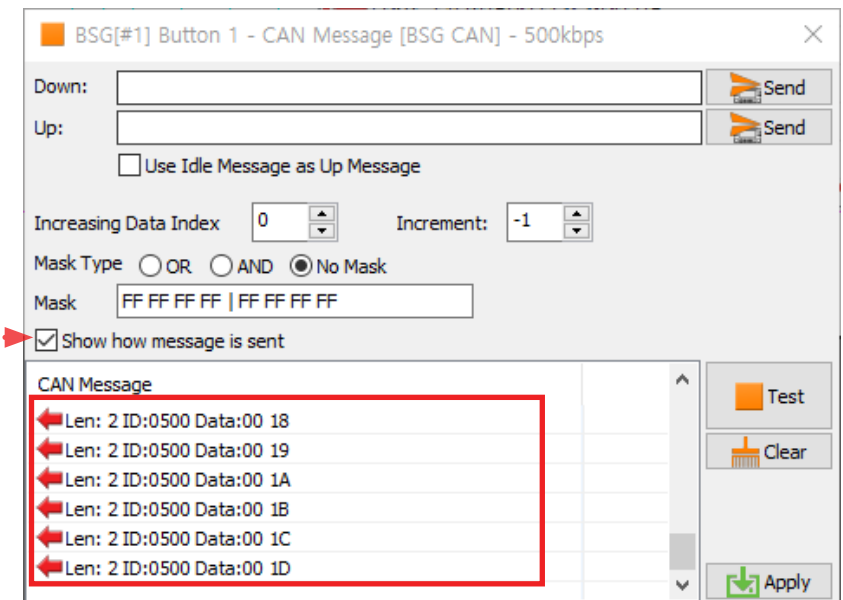
S Len: 2 ID:0500 Data:00 1B

S Len: 2 ID:0500 Data:00 1C

....



You can see the sent Idle Message at Button Property with checking **Show how message is sent**.



### 15-3-3. Mask of Idle Message

Increasing Data need to be limited for some car radio(or equipment).

To send the Increasing Data 0~0Fh, the higher bit need to be ANDed with 0x0F.

To send the Increasing Data F0h~FFh, the higher bit need to be ORed with 0xF0.

#### Example:

Idle Message is

Dur:100 Len: 4 sID:01 dID:50 Data:AB CD

**Increasing Data Index** is 2

**Increment** is 1

**Mask Type** is "AND"

**Mask** is "FF 0F FF FF | FF FF FF FF"

The messages are sent every 1 second to the Radio though BSGc like below.

Len: 2 ID:0500 Data:00 07

Len: 2 ID:0500 Data:00 08

Len: 2 ID:0500 Data:00 09

Len: 2 ID:0500 Data:00 0A

Len: 2 ID:0500 Data:00 0B

Len: 2 ID:0500 Data:00 0C

Len: 2 ID:0500 Data:00 0D

Len: 2 ID:0500 Data:00 0E

Len: 2 ID:0500 Data:00 0F

Len: 2 ID:0500 Data:00 00

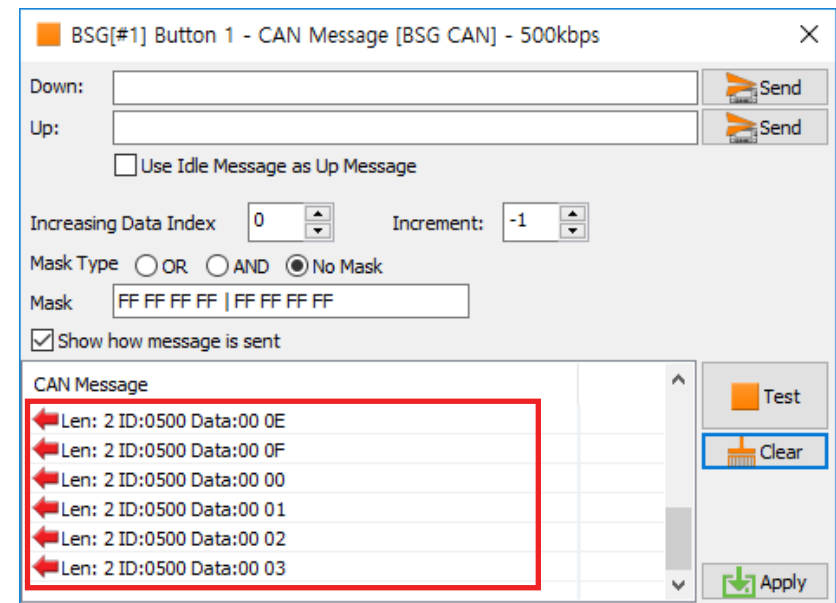
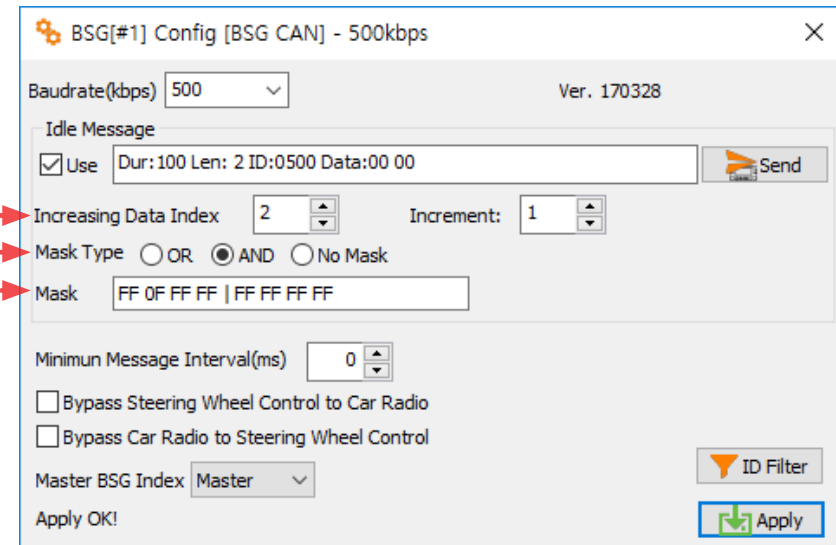
Len: 2 ID:0500 Data:00 01

Len: 2 ID:0500 Data:00 02

Len: 2 ID:0500 Data:00 03

Len: 2 ID:0500 Data:00 04

....



#### 15-4. Extension of BSG Index

One BSGc has 12 buttons.

If you need more than 12 buttons' CAN output for the radio or original equipment though BSGc device, you can use another BSG index as slave BSGc.

The CAN messages of the slave BSGc are outputted through one Master BSGc device.

If this BSG module is the master BSG module, choose "Master".

If this BSG module is the extension of the other BSG. choose the master BSG index of this BSG module at **Master BSG Index**.

For example,

If **Master BSG Index** is 1, this BSG index works as a part of the BSG index 1.

The Slave BSG shares the Idle Message of Master BSG.

BSG[#1] Config [BSG CAN] - 500kbps

Baudrate(kbps) 500 Ver. 170328

Idle Message

Use Dur: 100 Len: 2 ID:0500 Data:00 00 Send

Increasing Data Index 2 Increment: 1

Mask Type  OR  AND  No Mask

Mask FF 0F FF FF | FF FF FF FF

Minimun Message Interval(ms) 0

Bypass Steering Wheel Control to Car Radio

Bypass Car Radio to Steering Wheel Control

Master BSG Index Master ID Filter

Apply OK! Apply

BSG[#2] Config [BSG CAN] - 100kbps

Baudrate(kbps) 100 No J2P Device at #2

Idle Message

Use Send

Increasing Data Index 0 Increment: -1

Mask Type  OR  AND  No Mask

Mask FF FF FF FF | FF FF FF FF

Minimun Message Interval(ms) 0

Bypass Steering Wheel Control to Car Radio

Bypass Car Radio to Steering Wheel Control

Master BSG Index 1 Apply

Apply OK!

## 15-5. ID Filter of BSGc

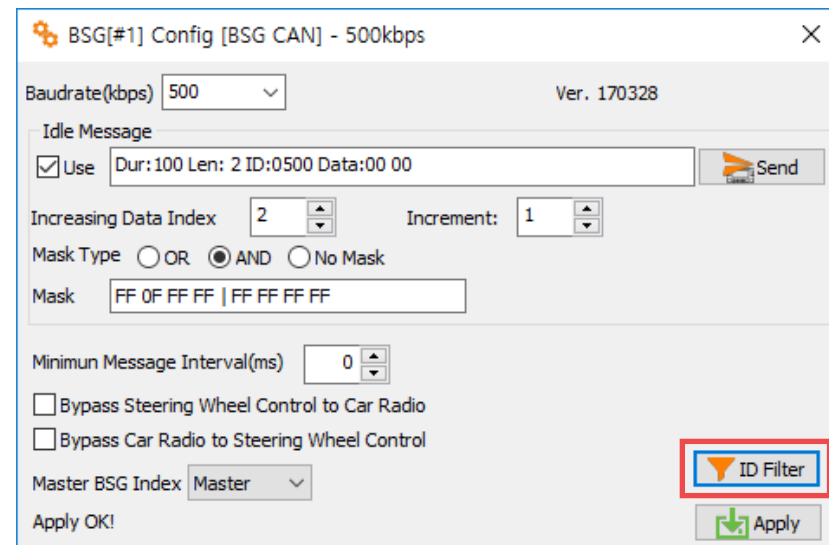
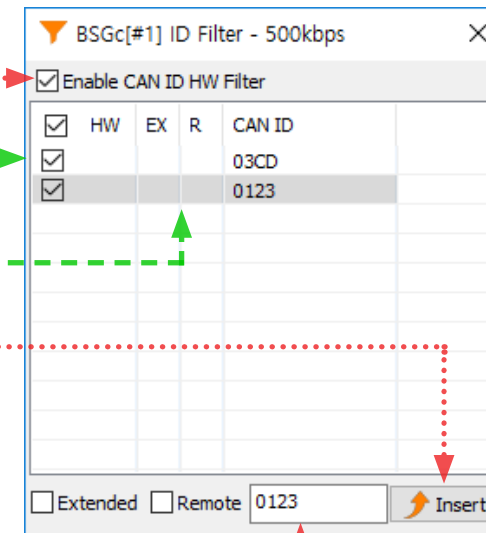
One BSG receives CAN messages from the original equipment(car radio). If too many CAN messages are received, the message you want may be omitted to be processed.

BSGc can filter out the CAN messages with Hardware CAN ID Filter, so that BSGc can process the CAN message you want or bypass them to the steering wheel controls .

To use BSGc HW ID Filter, check on **Enable CAN ID HW Filter**. Put the CAN ID in the edit box and click Insert.

Check on box **HW** of the CAN ID to activate HW Filter.

If a CAN ID is Extended ID or remote frame check on EX or R.



## 15-6. BSG Button Configuration

### 15-6-1. BSG Button Message Configuration

BSG button is composed of Up Button message and Down Button Message.

**Up Button** Message is sent through the BSGc when the steering wheel button is pressed.

**Down Button** Message is sent through the BSGc when the steering wheel button is released.

**Name** of BSG button is spoken when the Button is pressed.

Click the BSG Button, then Button Property pops up.

Type CAN message format string in Button Property or Drag&Drop or Copy&Paste CAN message from **CPJexc CAN Scanner** to Button Property.

The screenshot shows the 'Manager - [1(A):CPJexc] : New Preset.pr' window. The 'Preset Edit' button is highlighted. The 'Button' tab is selected, and a table lists buttons 1 through 12. The 'BSG' column for button 1 is highlighted with a red box and a 'Click' label. The 'BSG[#1] Button 1 - CAN Message [BSG CAN] - 500kbps' dialog box is open, showing configuration for 'Down' and 'Up' messages. The 'Show how message is sent' checkbox is checked, and a list of CAN messages is displayed. A 'Test' button is highlighted in blue, and an 'Apply' button is highlighted in red.

Test the configured BSG button with "Test" Button, or clicking the button number.

If **Show how message sent** is checked on, the CAN message sent through the BSGc are listed at the listbox.

Hard to type CAN format string?  
Type any character and click Apply, then CAN format string appears at the edit box.

## 15-6-2. Repeated Button

Some button repeats CAN message while the button is being pressed.

"Dur:" is the interval of the repeated CAN message. (Unit is 10ms.)

The Down Button Message is sent repeatedly while the button is being pressed.

### Example:

Down Button Message is .....

Dur: 10 Len: 4 ID:0683 Data:04 00 20 0D

While the button is being pressed, the messages are sent to the radio though BSGc every 100ms like below.

Len: 4 ID:0683 Data:04 00 20 0D

Len: 4 ID:0683 Data:04 00 20 0D

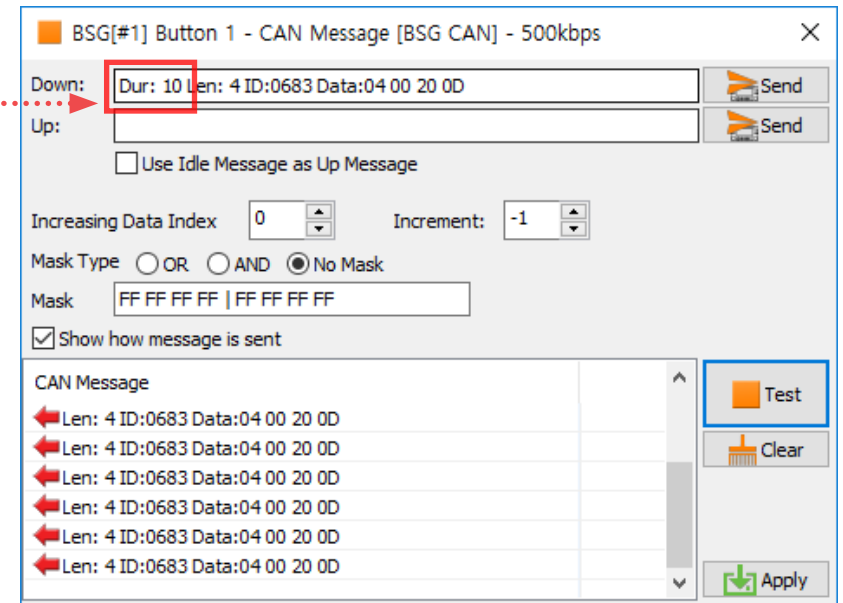
Len: 4 ID:0683 Data:04 00 20 0D

Len: 4 ID:0683 Data:04 00 20 0D

Len: 4 ID:0683 Data:04 00 20 0D

Len: 4 ID:0683 Data:04 00 20 0D

....





### 15-6-3. Increasing Data of Button Message

In some vehicle, a data of the Button Message needs to be increased every time it is sent.

The Button Message data indicated by **Increasing Data Index** is increased by **Increment** every time the Button Message is sent.

**Increment** can be -128 ~ 127.

If Increasing Data is not used, set 0 at **Increasing Data Index**.

#### Example:

Down Message is

Dur: 0 Len: 4 ID:0683 Data:04 00 20 0D

Up Message is

Dur: 0 Len: 4 ID:0683 Data:04 00 20 FF

**Increasing Data Index** is 2

**Increment** is 1

When the button is pressed and released, the messages are sent to the radio though BSGc like below.

S Len: 4 ID:0683 Data:04 09 20 FF

S Len: 4 ID:0683 Data:04 0A 20 0D

S Len: 4 ID:0683 Data:04 0B 20 FF

S Len: 4 ID:0683 Data:04 0C 20 0D

S Len: 4 ID:0683 Data:04 0D 20 FF

....

BSG[#1] Button 1 - CAN Message [BSG CAN] - 500kbps

Down: Dur: 0 Len: 4 ID:0683 Data:04 00 20 0D Send

Up: Send

Use Idle Message as Up Message

Increasing Data Index: 2 Increment: 1

Mask Type:  OR  AND  No Mask

Mask: FF FF FF FF | FF FF FF FF

Show how message is sent

CAN Message

← Len: 4 ID:0683 Data:04 09 20 0D
← Len: 4 ID:0683 Data:04 0A 20 0D
← Len: 4 ID:0683 Data:04 0B 20 0D
← Len: 4 ID:0683 Data:04 0C 20 0D
← Len: 4 ID:0683 Data:04 0D 20 0D
← Len: 4 ID:0683 Data:04 0E 20 0D

Test Clear Apply

### 15-6-4. Mask of Button Message

In some vehicle, Increasing Data need to be limited for some car equipment.

To send the Increasing Data 0~0Fh, the higher bit need to be ANDed with 0x0F.

To send the Increasing Data F0h~FFh, the higher bit need to be ORed with 0xF0.

#### Example:

Down Button Message is

Dur: 0 Len: 4 ID:0683 Data:04 00 20 0D

Up Button Message is

Dur: 0 Len: 4 ID:0683 Data:04 00 20 FF

**Increasing Data Index** is 2

**Increment** is 1

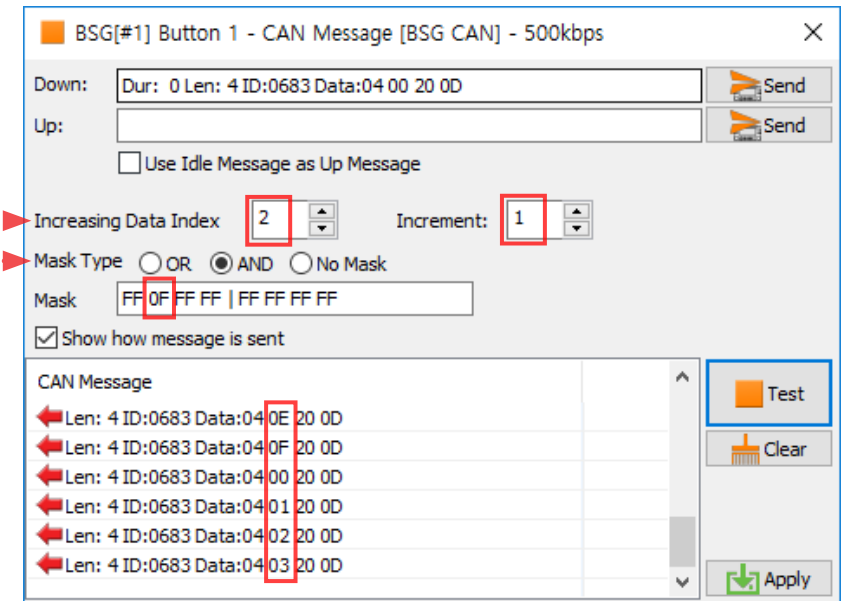
**Mask Type** is "AND"

**Mask** is "FF 0F FF FF | FF FF FF FF"

When the button is pressed and released, the messages are sent to the radio though BSGc like below.

Len: 4 ID:0683 Data:04 0C 20 0D  
 Len: 4 ID:0683 Data:04 0D 20 FF  
 Len: 4 ID:0683 Data:04 0E 20 0D  
 Len: 4 ID:0683 Data:04 0F 20 FF  
 Len: 4 ID:0683 Data:04 00 20 0D  
 Len: 4 ID:0683 Data:04 01 20 FF  
 Len: 4 ID:0683 Data:04 02 20 0D  
 Len: 4 ID:0683 Data:04 03 20 FF  
 Len: 4 ID:0683 Data:04 04 20 0D  
 Len: 4 ID:0683 Data:04 05 20 FF  
 Len: 4 ID:0683 Data:04 06 20 0D  
 Len: 4 ID:0683 Data:04 07 20 FF

....



## 15-6-5. Use Idle Message as Up Message

### 15-6-5-1. Common Up Button Message

Some steering wheel control button use common Up Button Message.  
You can use this option for the buttons to have common Up Button Message.

#### Example:

**Idle Message** is .....  
Dur: 0 Len: 2 ID:0500 Data:AB CD

**Down Button Message** is .....  
Dur: 0 Len: 4 ID:0683 Data:04 00 20 0D

Check on **Use Idle Message as Up Message**.....

When the button is pressed and released, the messages are sent to the radio though BSGc like below.

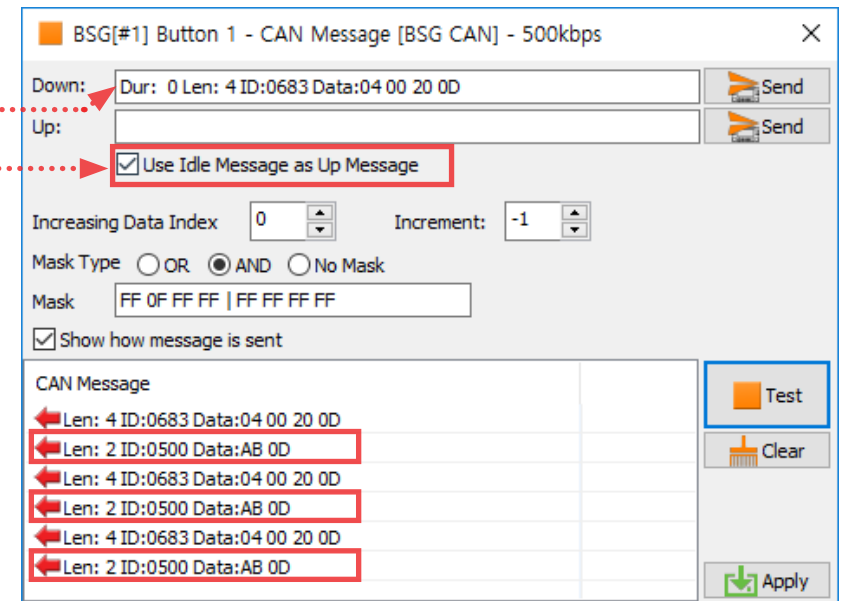
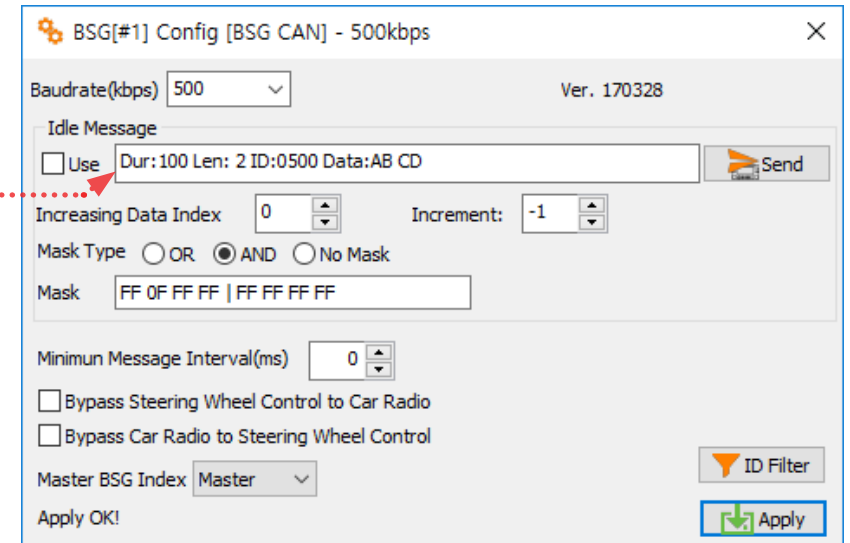
Len: 4 ID:0683 Data:04 00 20 0D

Len: 2 ID:0500 Data:AB CD

Len: 4 ID:0683 Data:04 00 20 0D

Len: 2 ID:0500 Data:AB CD

....



### 15-6-5-2. Common Increasing Data

Some steering wheel control button needs common increasing data both at Down Button Message and Up Button Message.

This option is used to give common increasing data both for Down and Up Button Messages.

#### Example:

**Idle Message** is .....

Dur: 0 Len: 2 ID:0500 Data:AB CD

**Down Button Message** is .....

Dur: 0 Len: 4 ID:0683 Data:04 00 20 0D

Check on **Use Idle Message as Up Message** .....

When the button is pressed and released, the messages are sent to the radio though BSGc like below.

Len: 4 ID:0683 Data:04 4E 20 0D

Len: 2 ID:0500 Data:AB 4F

Len: 4 ID:0683 Data:04 50 20 0D

Len: 2 ID:0500 Data:AB 51

Len: 4 ID:0683 Data:04 52 20 0D

Len: 2 ID:0500 Data:AB 53

....

BSG[#1] Config [BSG CAN] - 500kbps

Baudrate(kbps) 500 Ver. 170328

Idle Message

Use Dur: 100 Len: 2 ID:0500 Data:AB CD Send

Increasing Data Index 2 Increment: 1

Mask Type  OR  AND  No Mask

Mask FF 0F FF FF | FF FF FF FF

Minimum Message Interval(ms) 0

Bypass Steering Wheel Control to Car Radio

Bypass Car Radio to Steering Wheel Control

Master BSG Index Master ID Filter

Apply OK! Apply

BSG[#1] Button 1 - CAN Message [BSG CAN] - 500kbps

Down: Dur: 0 Len: 4 ID:0683 Data:04 00 20 0D Send

Up: Send

Use Idle Message as Up Message

Increasing Data Index 0 Increment: -1

Mask Type  OR  AND  No Mask

Mask FF 0F FF FF | FF FF FF FF

Show how message is sent

CAN Message

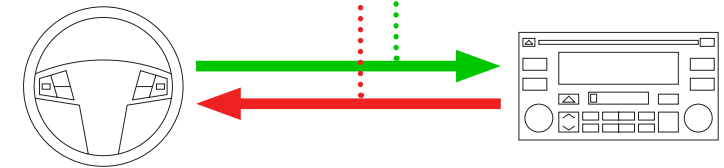
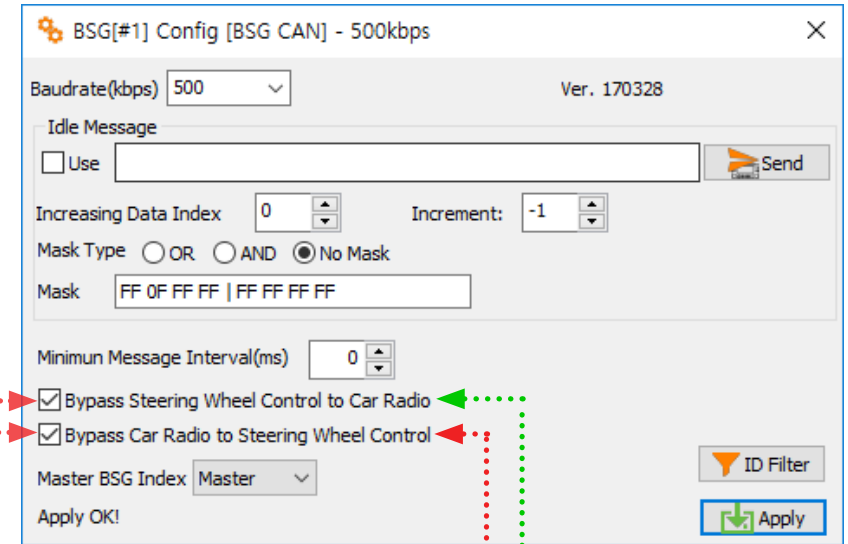
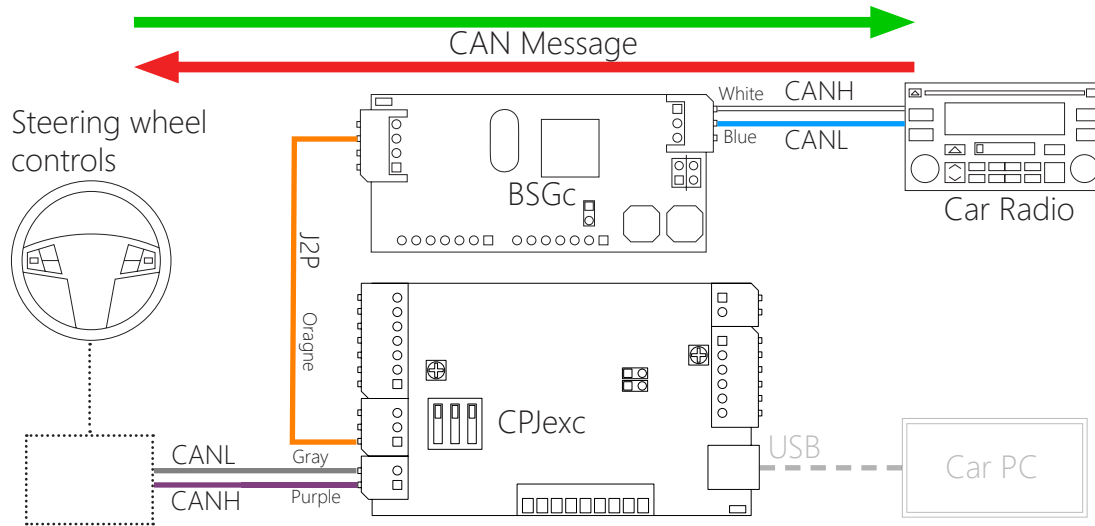
- Len: 4 ID:0683 Data:04 4E 20 0D
- Len: 2 ID:0500 Data:AB 4F
- Len: 4 ID:0683 Data:04 50 20 0D
- Len: 2 ID:0500 Data:AB 51
- Len: 4 ID:0683 Data:04 52 20 0D
- Len: 2 ID:0500 Data:AB 53

Test Clear Apply

### 15-7. Bypass of CAN Message

If not all of the steering wheel control buttons are used for the car PC, you may want some button still work for the car radio.

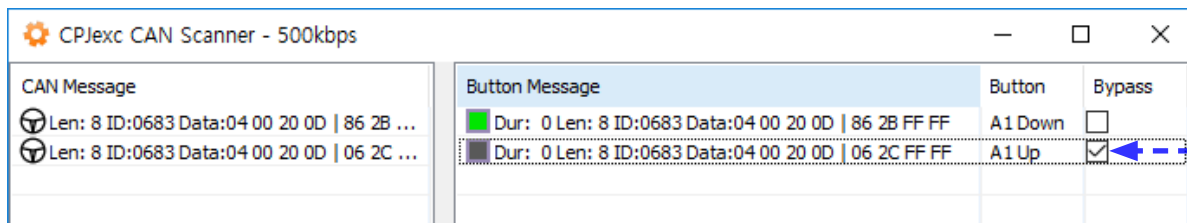
Because CPJexc is wired between the steering wheel control and the car radio, CPJexc need to bypass the messages which are used for original equipment(car radio).



If **Bypass Steering Wheel Controls to Head Unit** is checked on, CPJexc bypasses all the messages originate from the steering wheel controls except the messages used as a button message.

If you want to bypass the button message from steering wheel control to the car radio, check **Bypass** at the button message list in CAN Scanner. Usually the Up Button Message need to bypass to the car radio.

If **Bypass Head Unit to Steering Wheel Controls** is checked on, CPJexc bypasses all the messages originate from the car radio.



Button Message	Button	Bypass
Dur: 0 Len: 8 ID:0683 Data:04 00 20 0D   86 0...	A1 Down	<input type="checkbox"/>
Dur: 0 Len: 8 ID:0683 Data:04 00 20 0D   06 0...	A1 Up	<input checked="" type="checkbox"/>

The CAN message from the BSGc to the car radio is shown at BSG button property dialog when "Show how message is sent" is enabled.

Down: Dur: 0 Len: 4 ID:0683 Data:04 00 20 0D [Send]

Up: [Send]

Use Idle Message as Up Message

Increasing Data Index: 0 Increment: -1

Mask Type:  OR  AND  No Mask

Mask: FF 0F FF FF | FF FF FF FF

Show how message is sent

CAN Message
← Len: 4 ID:0683 Data:04 00 20 0D
← Len: 4 ID:0683 Data:04 00 20 0D
← Len: 4 ID:0683 Data:04 00 20 0D
← Len: 4 ID:0683 Data:04 00 20 0D
← Len: 4 ID:0683 Data:04 00 20 0D

[Test] [Clear] [Apply]

## 15-8. Connecting Steering wheel button to BSG button

Drag&Drop a button to the BSG buttons to use steering wheel buttons for BSG Buttons. Then the BSG button works by the steering wheel control button.

This is same with connecting the steering wheel buttons to USB keyboard or HID remote controller.

The screenshot shows the 'Manager - [1(A):CPJexc] : New Preset.prs\*' window. The interface is divided into several sections:

- Top Bar:** Includes a 'Preset Edit' button and tabs for 'Option' and 'About'.
- Folder/Buttons:** A row of tabs for 'Folder', 'Button', 'Voice', 'Preset', 'Misc', and 'FW'. Below this is a '1(A):CPJexc New Preset' section with icons for file operations and a 'Preset App Launcher' button.
- Left Panel (Table):** A table with columns 'A', 'B', 'C/D', 'LED', 'BSG', and 'EXT'. It has rows numbered 1 to 12. Row 1 is selected, showing 'Down' as '1:0683 Da' and 'Up' as 'Next Track'. Below the table are fields for 'Phone' and 'Type BSG(CAN)' with a '500kbps' setting.
- Main Area:** A visual representation of the steering wheel buttons. A red arrow labeled 'Drag&Drop' points from button 'A1' in the left panel to button 'C1' in the 'BSG 1 - BSG CAN' panel. The 'BSG 1 - BSG CAN' panel shows a 12-button grid with buttons 1-4 highlighted in green. Below it is another 12-button grid labeled 'A1 = Next Track'.

## 16. BSG for Internal CAN BUS

BSG for Internal CAN BUS is almost same with BSGc(BSG for CAN BUS).

But the output of BSG for Internal CAN BUS goes through onboard CAN BUS.

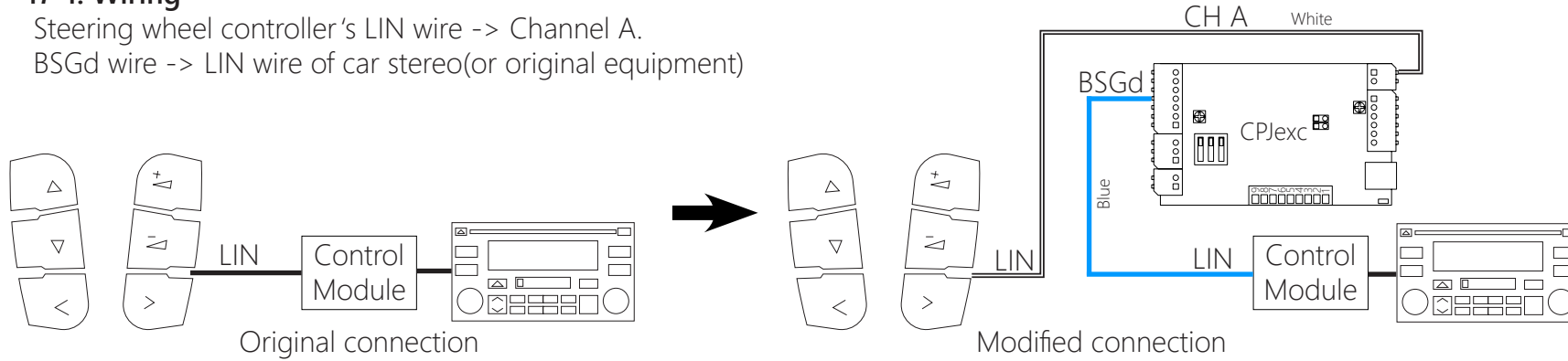
This can be used to send CAN messages to control car equipment(ex. windows, headlight ect.).



## 17. BSG for AUDI '99-'04(LIN) and VW(Volkswagen) '99-'04(LIN)

### 17-1. Wiring

Steering wheel controller's LIN wire -> Channel A.  
 BSGd wire -> LIN wire of car stereo(or original equipment)



### 17-2. Manager Setting

Choose the **BSG** index.  
 Choose AUDI'99-'04(LIN) or VW '99-'04(LIN) at **Type**.

The screenshot shows the 'Manager - [1(A):CPJexc] : New Preset.prs' window. The 'Preset Edit' tab is active. The 'Folder' dropdown is set to 'Button'. The 'BSG' tab is selected in the top navigation bar. A list of BSG buttons is shown on the left, with buttons 1, 2, and 3 highlighted in a red box. The 'Type' dropdown at the bottom is set to 'AUDI '99-04(LIN)'. A red arrow points from the 'BSG' tab to the 'BSG 1 - BSG AUDI 99-2004' section, which contains a grid of 12 buttons. A red arrow points from the 'BSG 1' section to the 'BSG CAN' section, which also contains a grid of 12 buttons. A text box at the top right says 'Name of BSG button is spoken when the Button is pressed.' A text box in the middle says 'Drag&drop a button to the BSG button, then the BSGc button works by the steering wheel control button.' A red arrow labeled 'Drag&Drop' points from the 'BSG 1' section to the 'BSG CAN' section.

The latest manual is at  
<http://www.exInterface.com/mn/cpjexc>

