FCU CBUS Modules Guide

For FCU from Version 1.4.7.42

A Companion to the FCU User Guide

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Updated
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1. Introduction

This document should be read in conjunction with the FCU Use Guide. This document contains full details for configuring the Merg CBUS module using the FCU

2. The CBUS Modules

2.1 The CANACC4 & CANSOL

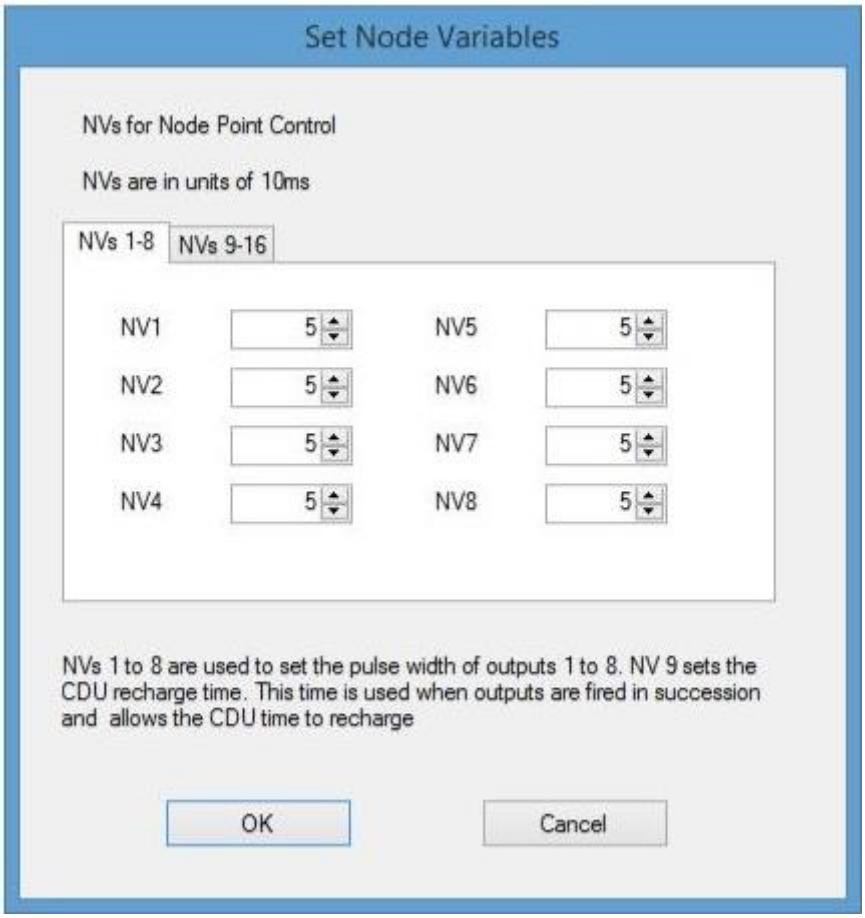


Figure 1. Node Variables

2.1.1 The Node Variables

The Node Variables determine the pulse width of each output, they are specified in units of 10ms, and the default is 50ms.

From firmware version NV9 on the second tab is used to set the CDU recharge timer. This timer is used by the firmware to determine the time that must elapse before firing the next output. The timer is specified in units of 10ms, the default time is 200ms.

Note that a time of zero will give a continuous output, setting an output on continuously will prevent the CDU from recharging, so it is recommended that continuous and pulsed outputs should not be mixed on the same module.

2.1.2 Events

The module has four outputs. An event may be taught to just one output or any combination of up to four outputs. Select either the A or B output to teach the event to control the output. If output A is selected, an ON event will operate output A and an OFF event will operate output B. If output B is selected, then the ON event will operate output B and an OFF event will operate output A.

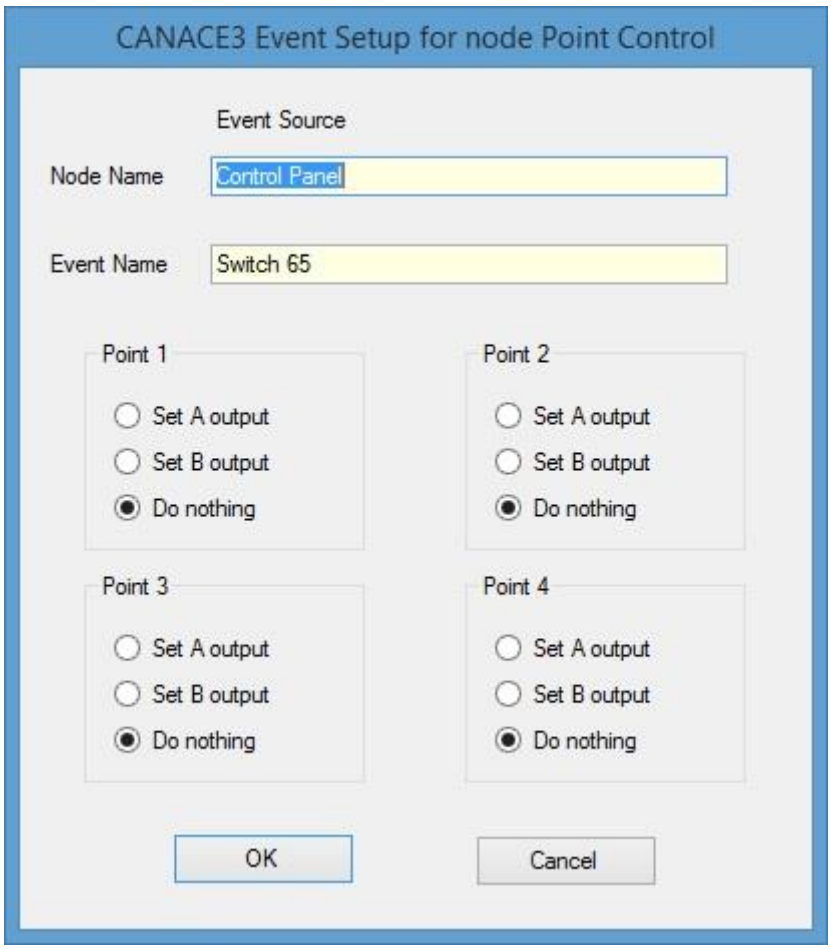


Figure 2. Event Teaching

2.2 The CANACC5, CANACC8, CANBIP-OUT, CANOUT, CANVOUT & CANV4BIP

The CANBIP-OUT and CANV4BIP are updated versions of the CANACC5. The CANMIO-OUT & CANVOUT are updated versions of the CANACC8. The modules are functionally equivalent to their predecessors. These new modules use the PIC18F26K80 and are designed for 12v working. These new modules support an additional 8 inputs using the MIO-ADD satellite board or on board with the CANVOUT & CANV4BIP . The Mio board plugs directly into the new PCB of the CANMIO variants.

2.2.1 Node Variables

The behaviour of each output can be set to be one of, continuous, single pulse or repeated pulses. The default is continuous which is compatible with previous versions of CANACC5 or CANACC8, upgrading from earlier versions will preserve this setting. Note that if the continuous option is selected, the Pulse width field is disabled.

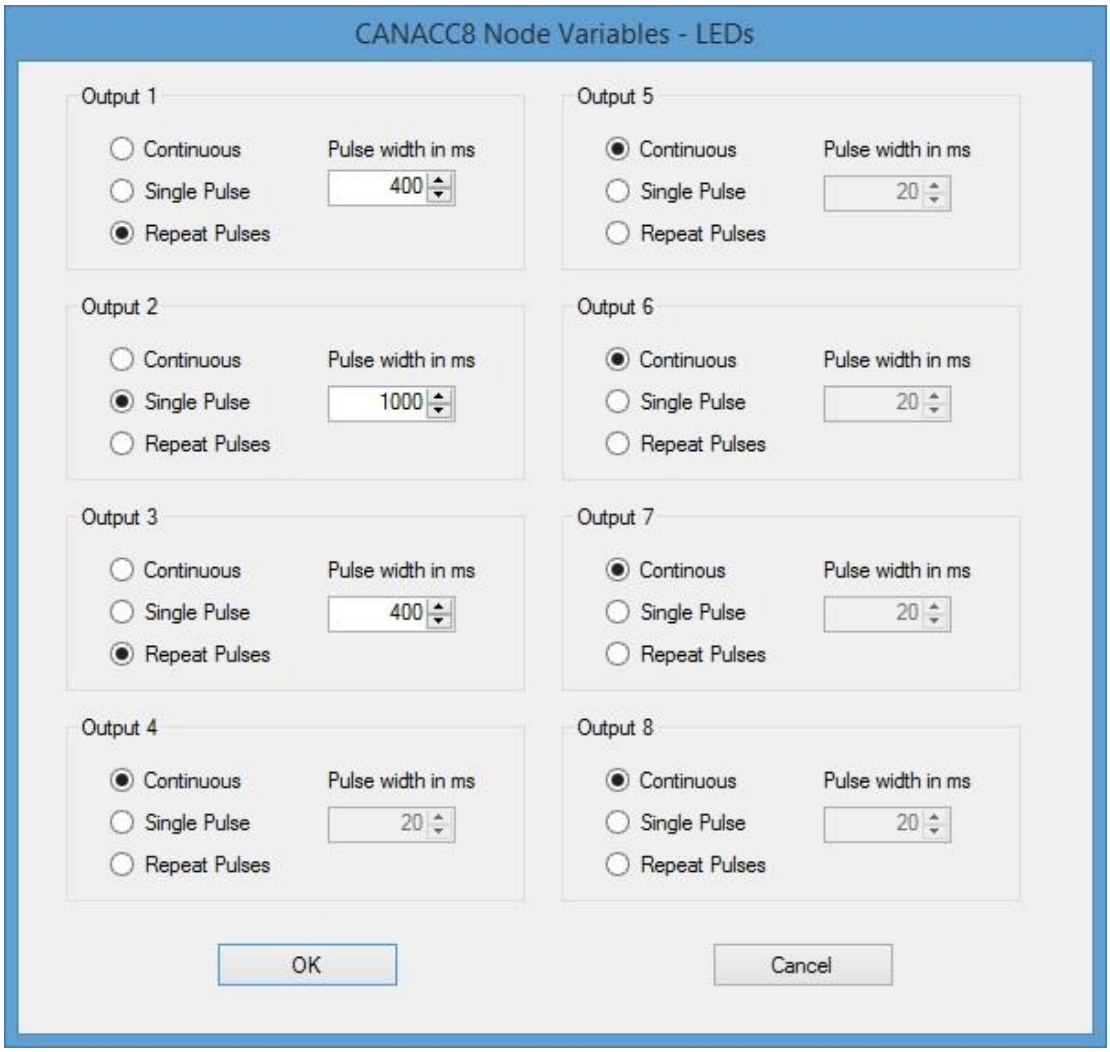


Figure 3. Node Variables

2.2.2 Events

These modules have eight individual outputs. However, if the CANACC5, CANBIP-OUT or CANV4BIP are being used to drive Tortoise style point motors the outputs must be used in odd/even pairs. For example, Output 1 and output 2 would be used to control one or more Tortoise motors. The outputs should be set so that that their operation is the inverse of each other, output 1 being set to ON and output being set to OFF. If the Tortoise operates in the wrong direction, just reverse the settings of the two outputs. The CANACC5, CANBIP-OUT & CANV4BIP can also be used with 8 separate outputs, or a combination of paired output and individual outputs.

The CANACC8, CANMIO-OUT & CANVOUT just have eight individual outputs which are controlled separately.

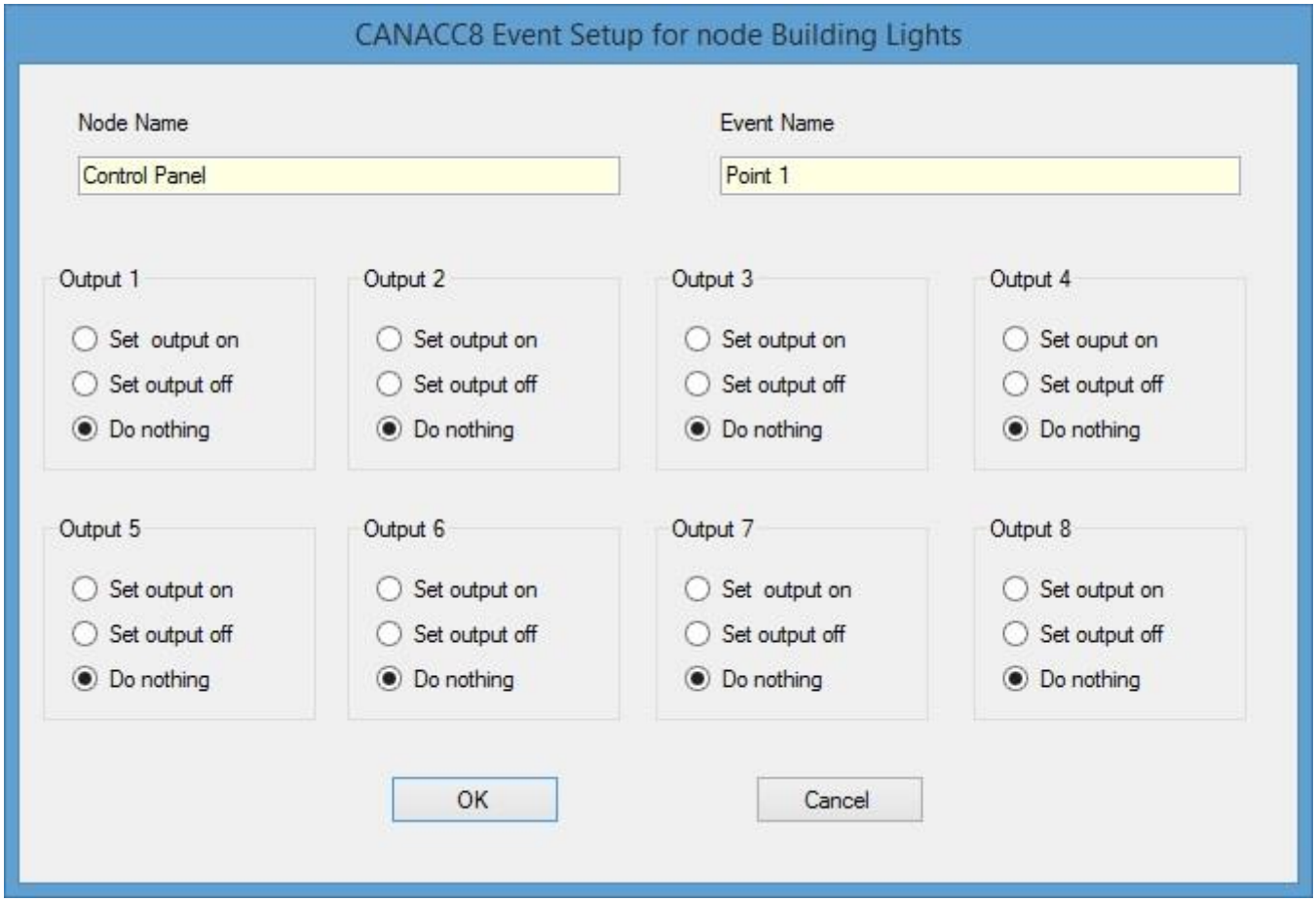


Figure 4. CANACC5/CANACC8 Event Teaching Dialogue

2.2.3 The Enhanced Firmware version

All the existing capabilities of the existing modules have been maintained in the newer versions. This includes the pulse and flashing modes. However, the extended capabilities are only available in FLiM and require setting up.

Each of the 8 outputs can be allocated a single feedback event, there is a single event on the CANACC5C. The CANACC5 / 8 sets its outputs in a single command, unlike the CANSERVO, the outputs cannot be set sequentially. Provided feedback events have been taught to the outputs, the feedback event will be sent to indicate whether the output is on or off. Although there is no delay between the settings of the outputs, there is a programmable delay before the feedback event. Where an event changes multiple outputs, this delay is used between every feedback event to prevent a burst of sequential events.

The state indicated by the feedback is that of the 'logical' state and not the actual state of the output. Hence if the flashing mode or pulse mode is set, there will be a single on or off feedback event, even though the output may be alternating or have completed its pulse

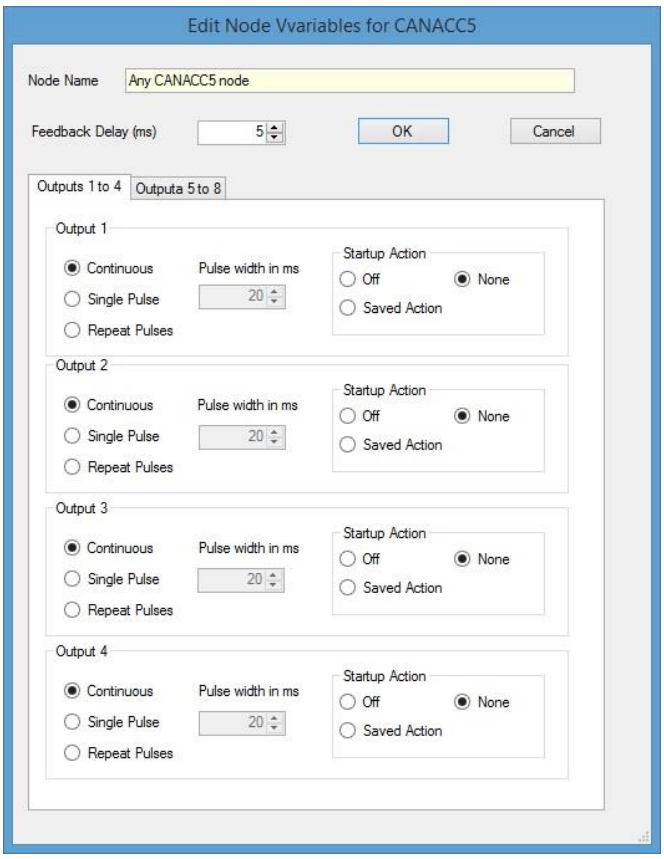


Figure 5. Enhanced Node Variables

In addition to the output control, the ability to set the start-up action has been added for each output. The three options are

Off – the output is set Off

Saved Action – the output is set to the last saved state.

None – The output does not change.

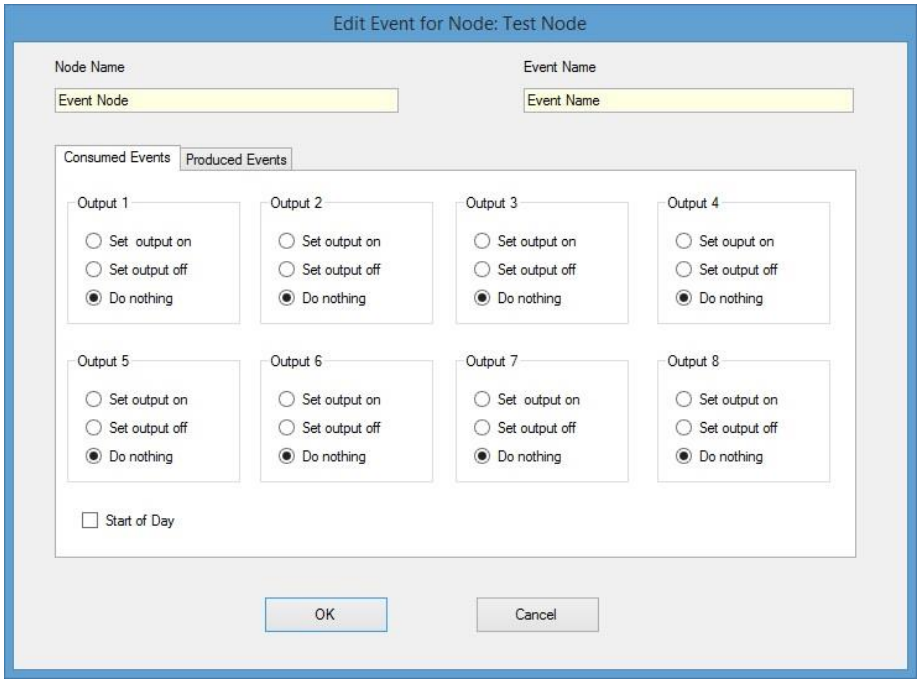


Figure 6. Enhanced Event Teaching for the modules – Consumed Events

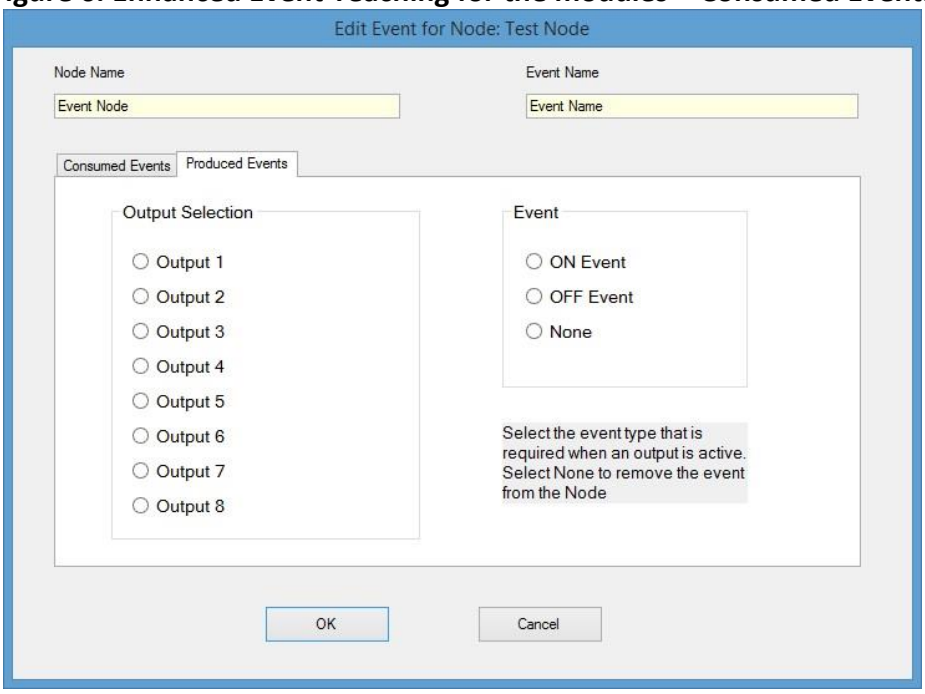


Figure 7. Enhanced Event Teaching Dialogue – Produced Events

Select the output to which the feedback event will apply and then select the event type that will be produced.

This dialogue is used exactly as the original Event Teaching Dialogue. However, it has been enhanced to add a second tab which is used to specify the feedback events. In addition, the ability to specify a Start of Day event has been added. This responds with ON or OFF feedback events for each output that has been taught a feedback event reflecting the current state of the output. The programmable delay is used between each response. This delay is set in the enhanced Node Variables Dialogue.

2.3 The CANACE3

2.3.1 Node Variables

The Node Variables select the operating mode of the switches/push buttons. You should set the operation mode before using any switches as the events generated by a particular switch can change if the operating mode is changed after a switch has been used to control consumer module. Note that the reference to Toggles in the dialogue means ON/OFF Toggle Switches.

Once the operating mode has been selected, operate all the switches connected to the CANACE3 module, you should see the event messages appear in the received message list box and the events will appear in the Event Grid for the selected CANACE3 module.

At this stage all the events will have a default name of “Event n”, where n is the event number. You can edit the names to something more meaningful as each switch is operated, or you can do it later. To edit the event name, select the event in the Event Grid and choose Events/Edit Name or right-click the event in the Event Grid and select Edit Name from the pop-up menu.

You can only edit the event name of a producer event; the option is disabled if the selected Node is a consumer node.

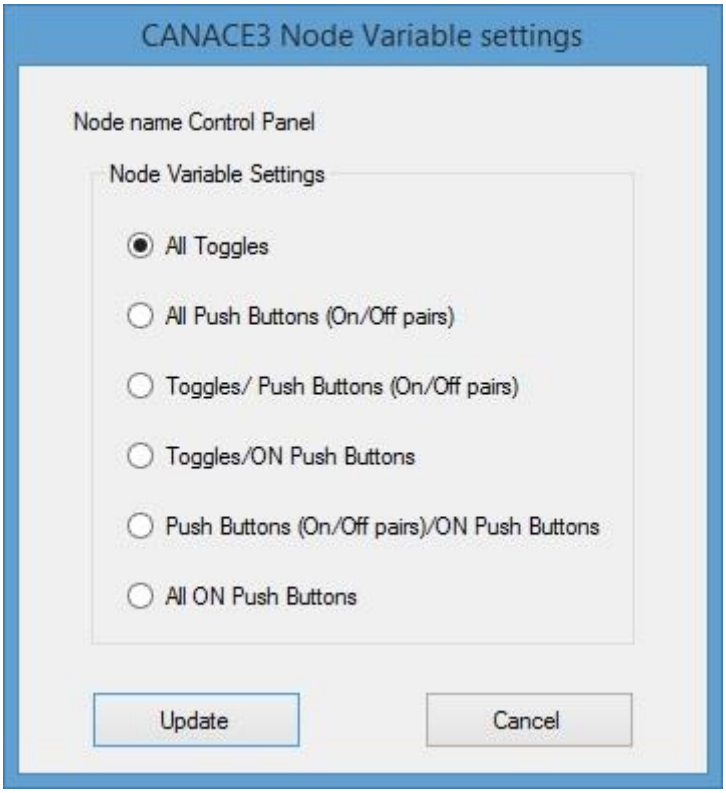


Figure 8. Setting Node Variables

2.3.2 Teaching Events

It is possible to teach any switch to produce a specific event. As the CANACE3 is an event producer the mechanism differs from that used to teach consumer nodes. An event is taught using the existing interfaces, for instance drag and drop or Events/Teach menu item, but behind the scenes, the mechanism is different.

A message box is displayed as shown below when an event is to be taught to an CANACE3 node. The FCU needs to know the switch number that is to be taught, the number is returned from the ACE3 when the chosen switch is operated. The target event can then be taught to that switch.

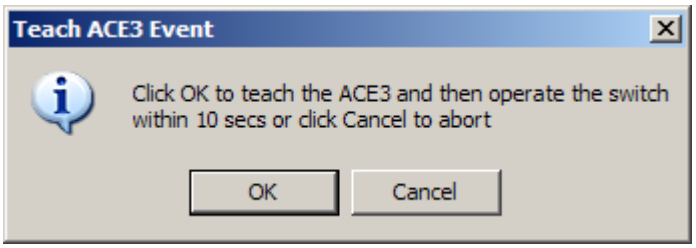


Figure 9. Teach Event

To delete an event from the ACE3, select the ACE3 in the Node Grid and then select the event in the Event Grid. Select the Events/Delete menu item and click OK when asked to confirm the deletion. The switch will revert to generating its default event. The event is not deleted from any other nodes that may also generate the event or use it, if you wish to delete any of these events you must delete them individually.

If you select an ACE3 in the Node Grid and then select Nodes/Read Events then the Event Values column in the Event Grid will be populated with the switch number that generates each event.

2.4 The CANACE3C

2.4.1 Node Variables

The CANACE3C module is a development of the CANACE3. It adds support for handling and generating a Start of Day event and a more flexible method for configuring the Switches or Push Buttons. Switches are arranged in blocks of 16 and each block can be set to act in 7 different ways. These actions are shown in the following dialogue and described below.

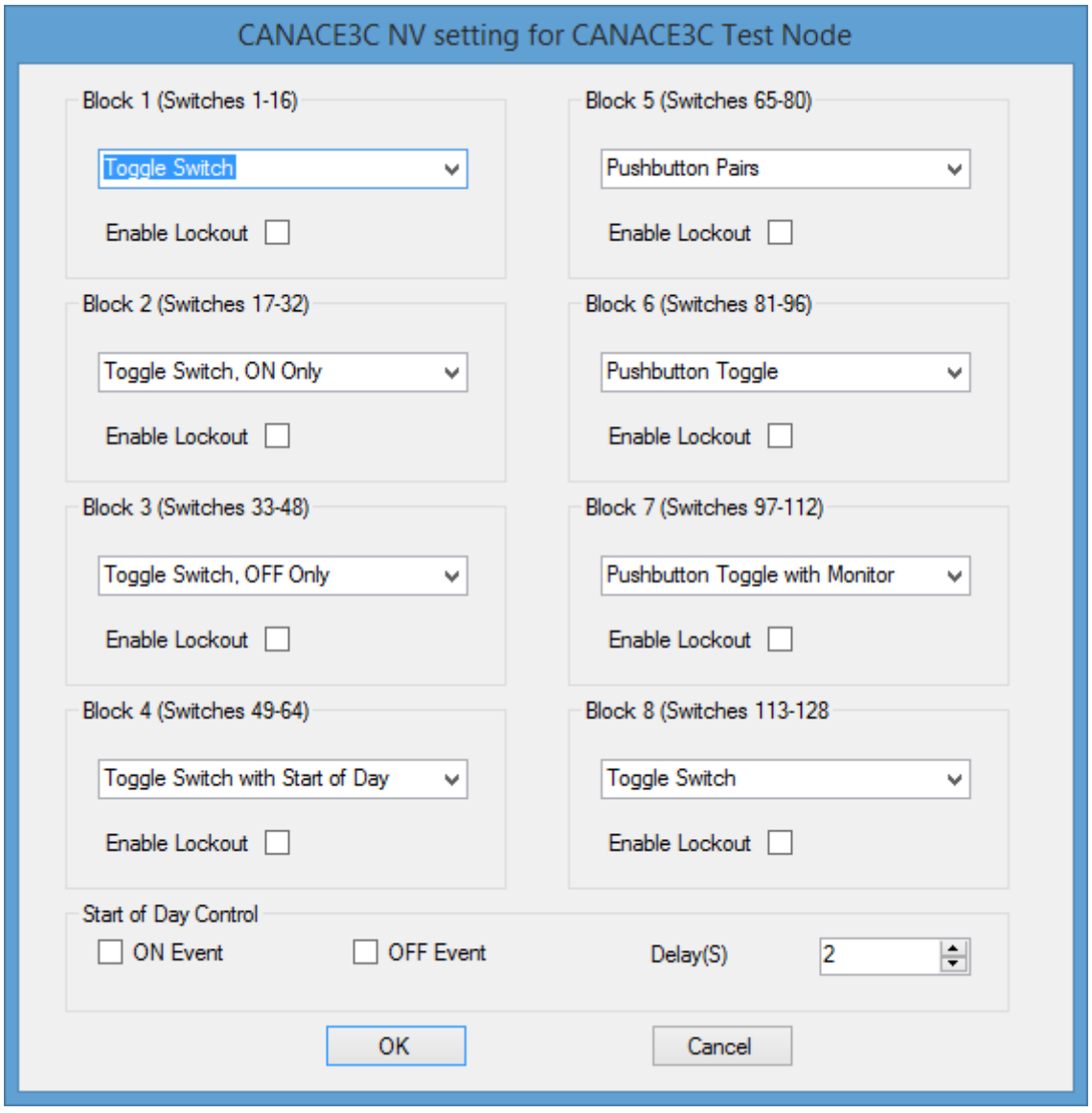


Figure 10. Node Variables Dialogue

The switch modes for the CANACE3C are

1. Toggle Switch
2. Toggle Switch with Start of Day
3. Toggle Switch ON only
4. Toggle Switch OFF only
5. Push Button Pairs
6. Push Button Toggle
7. Push Button Toggle with Monitor

Toggle switches can be set to act in one of 4 ways, normal ON/OFF action, ON only action, OFF only action and to respond to a Start of Day event with the current setting of the switch

Push Buttons can be configured to act in one of 3 ways, Push Button Pairs, Push Button Toggle and Push Button Toggle with Monitor. Note that if Push Button Pairs are selected for a 16 switch block, an odd numbered switch will generate an ON event and even numbered switch will generate an OFF event. A Push Button configured to act as toggle will alternate between ON and OFF events on each press of the button. If Push Button Toggle with Monitor is selected, the CANACE3C will monitor CBUS events to keep the toggle state in step so the next PB press will generate the correct event.

A Lockout option is available for each block of 16 switches.

In addition, the CANACE3C can be configured to generate a Start of Day event after power on. This event can be set to occur up to 255 seconds after power on. The event generated is the same Start of Day event that the module is taught to respond to. This event can be set to generate an ON event, an OFF event or both.

2.4.2 Teaching Switch Events

Just as the CANACE3 module, this module can be taught to generate a non-default event for any switch. The dialogue for teaching switch is shown below. Events are taught to the CANACE3C using any of the mechanisms for teaching events. The simplest method is to use Drag and Drop, see the FCU User Guide for more information.

To set a switch to generate the selected event, check the first Radio Button, click OK and then operate the target switch within 10 seconds.

To set an event as a Start of Day event, or a Lockout event, select the appropriate Radio Button. There is no need to operate any switch for these two options, just click OK. An ON-lockout event will disable all switches in a block with the lockout option set. An OFF-lockout event will re-enable the switches. Note that switches configured respond to a Start of Day event will respond to the Start of Day event generated by the CANACE3C.

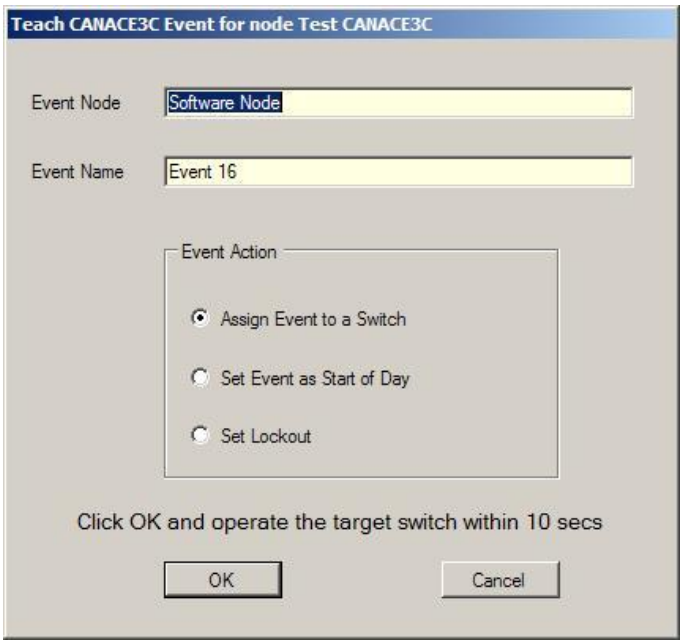


Figure 11. CANACE3C Event Teaching Dialogue

2.5 The CANACE8C, CANINP & CANTOTI

The CANINP is a new module which uses the 18F2480 PIC. It is designed for 12v DC power.

2.5.1 Node Variables

The original NVs teaching dialogue has been modified to have two tabs. The first tab contains all the basic settings. The second tab is for more advanced Users.

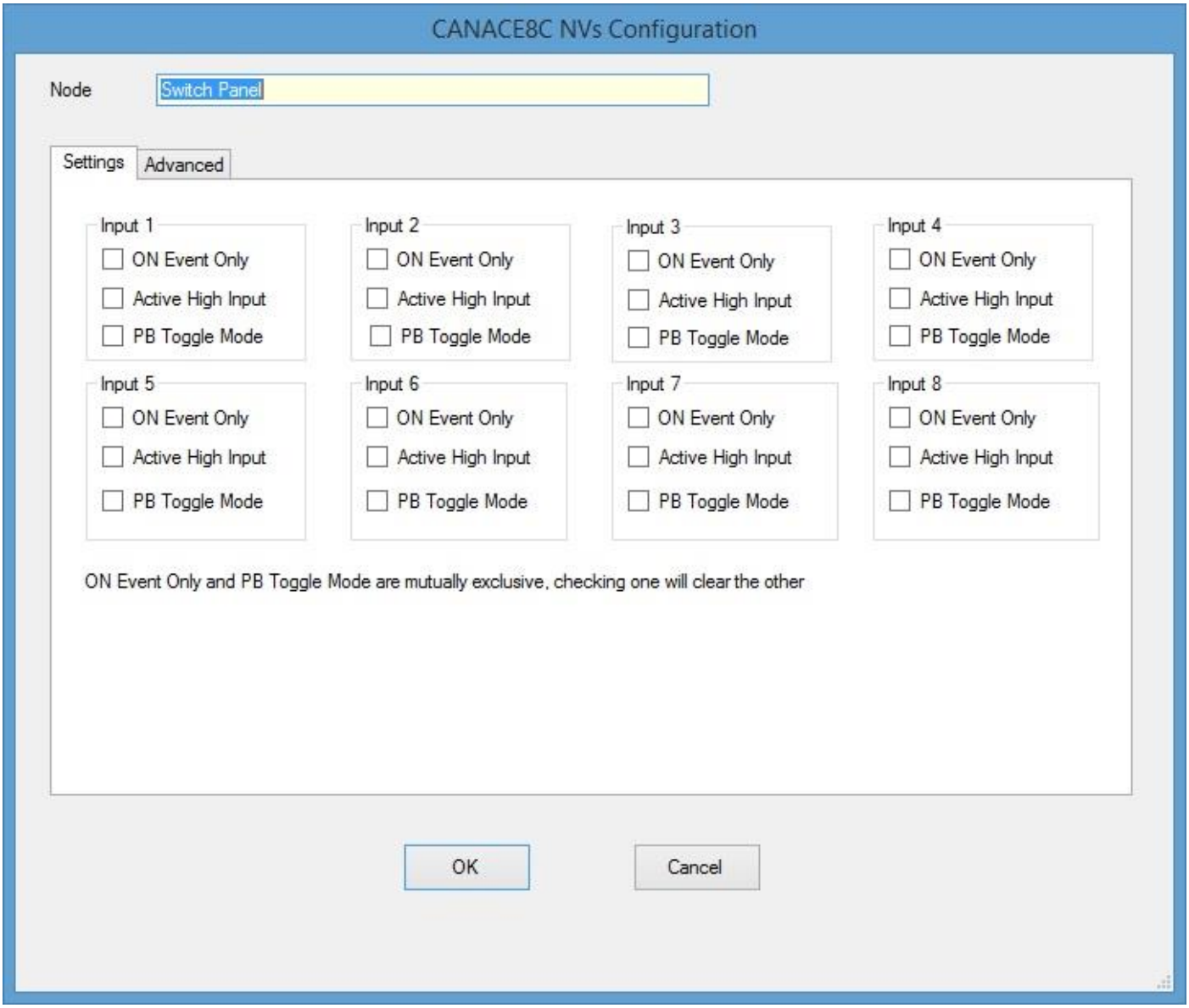


Figure 12. Basic Settings for Node Variables

For each input select the following options.

ON Event only – if selected, the input will only generate ON events.
Active High Input – if selected, the input will generate an ON event when the input goes high.
PB Toggle Mode - When PB Toggle mode is selected, pressing a push button connected to an input will alternate between sending an On Event and an Off Event.

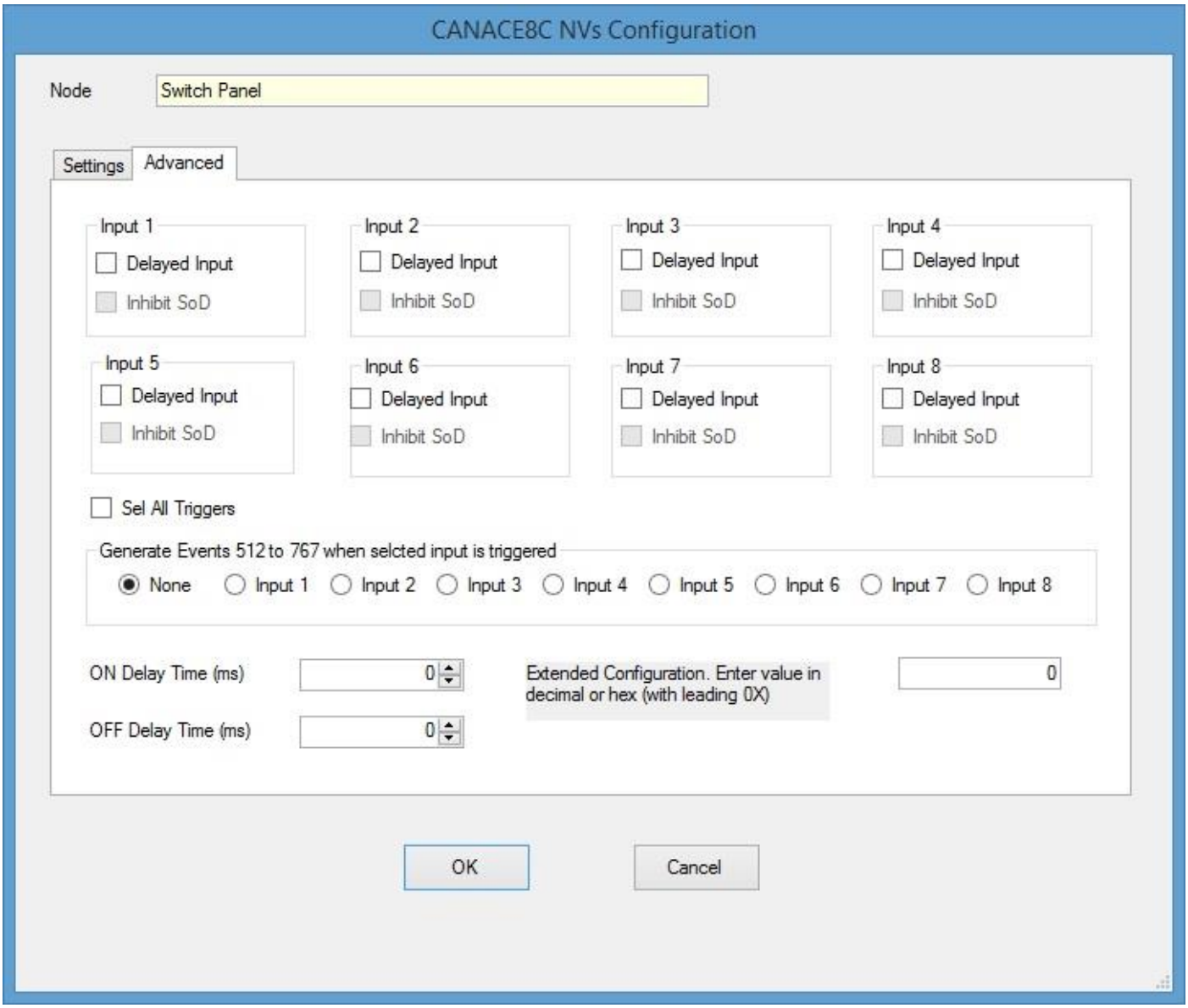


Figure 13 – Advanced NVs teach Dialogue

Delayed Input – if selected the input must be ON for at least the ON Delay Time before an ON event is generated and must be OFF for at least the OFF-delay time before an OFF event is generated.

When an input is selected for a 256 Event Trigger, then when that input changes state an event will be generated with the input state of all inputs in the least significant byte of the event value. To distinguish this event type, 512 is added to the event value, so the higher byte will contain 0x02.

2.5.2 Event Teaching

If you intend to use a "Start of Day" event for the CANACE8C based modules, then to teach the CANACE8C nodes their "Start of Day" event, select the source Node that is to produce the event in the Node table and scroll the Event Grid if necessary to bring the desired event into view. Now scroll the Node Grid to bring the target CANACE8C into view, be careful not to change the selection. Drag and drop the event in the lower window onto the desired node in the upper window. The mouse cursor changes to an arrow with an attached "+" symbol when you move into the Node Grid. The CANACE8C event teaching dialogue will open,

see Figure 14. Check that the Node Name and Event Name are correct and click OK, the Start of Day option is the default.

The event teaching dialogue will open, see Figure 14 below. Check that the Node Name and Event Name are correct and click OK, the Start of Day option is the default. Note The enhanced dialogue shown in Figure 15 will be displayed if the event source node is the Software Node, the event being taught is a Short Event.

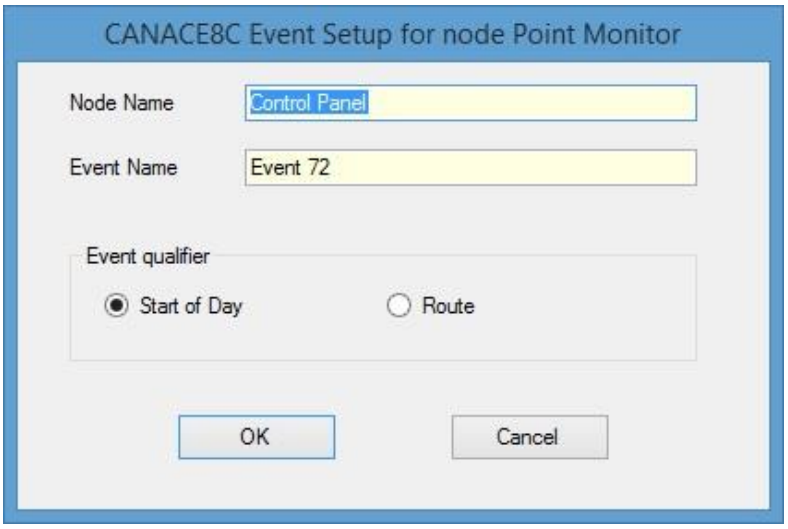


Figure 14 – Basic CANACE8C event teaching dialogue

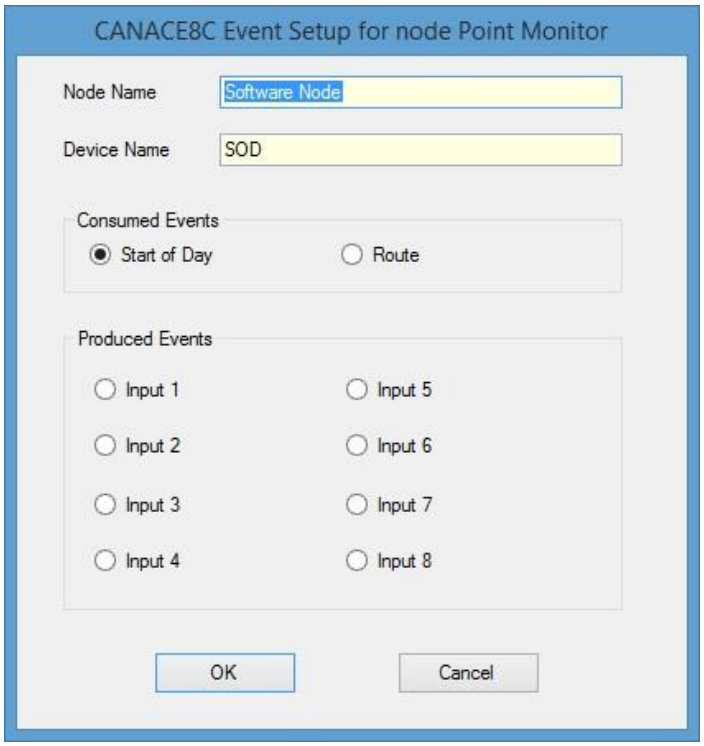


Figure 15. Enhanced CANACE8C Event Teaching

2.6 The CANCOND8C

2.6.1 Events

The CANCOND8C is a CBUS module that allows an event to be generated when several other events have occurred. The firmware runs on CANACC8 hardware. It is intended that the module will be useful for implementing interlocking, a facility which is currently lacking in CBUS.

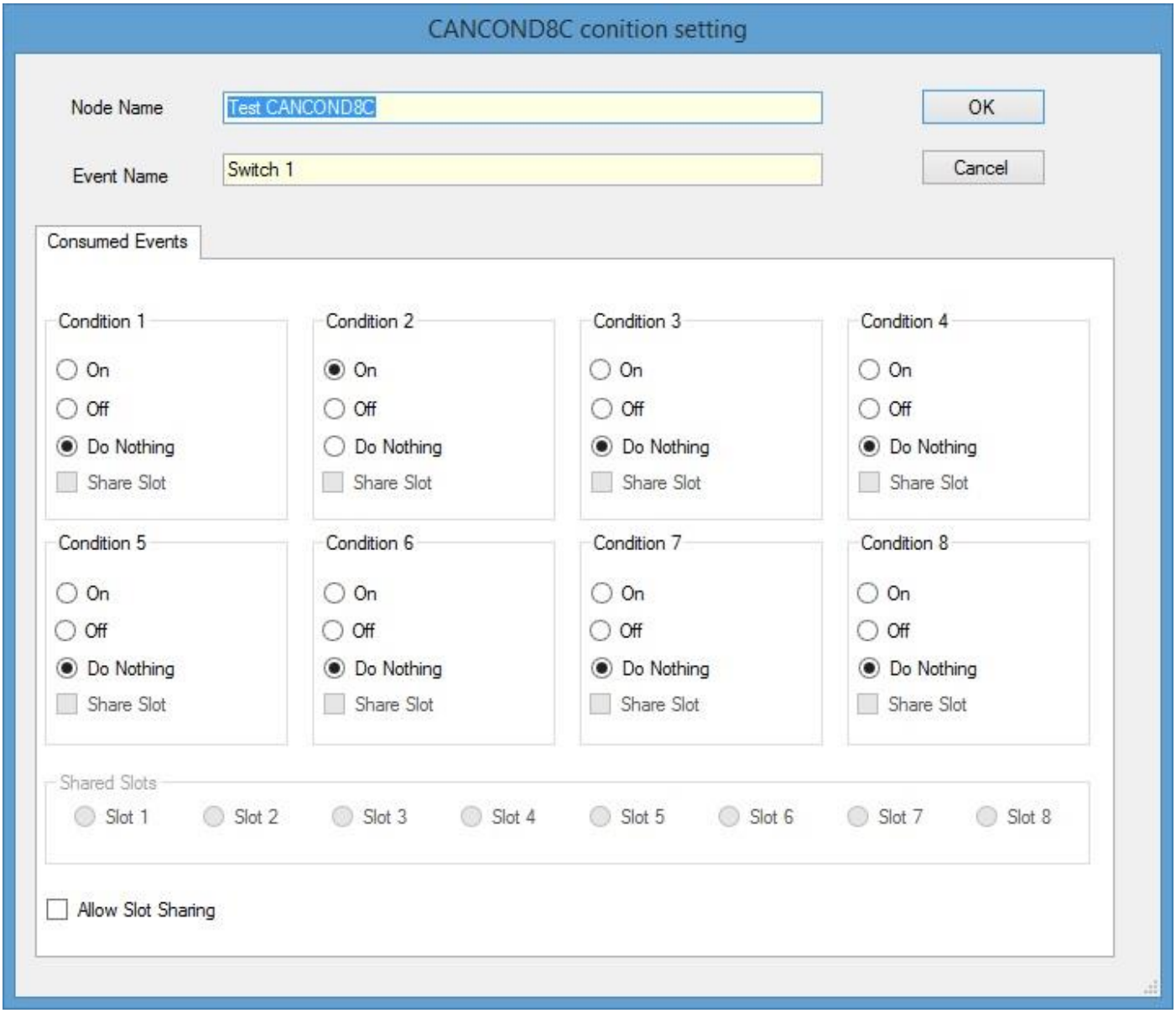


Figure 16. CANCOND8C Event Teaching Dialogue

There are 8 Conditions, each of which can have up to 8 events associated with the condition. The individual events for each condition are allocated to one of 8 “slots” within the condition by the FCU. The condition events may be either ON or OFF events. When all events have occurred, that is the condition is true, the CANCOND8C generates an ON event and sets the corresponding output to active (i.e. 0v), condition 1 sets output 1 etc. The event value in the event message generated by the CANCOND8C has the values from 1 to 8 depending on which condition generated the event. When the condition becomes false an OFF event is generated, and the corresponding output is turned off. Note that there are two selectable

tabs in the above screen shot. The Produced Events tab is only visible if the event being taught is a short event. To teach the module to produce a Short Event, select this tab.

The condition data is retained by the firmware in Flash Ram. The firmware uses 17 Event Variables (EVs) to hold the condition data. This is logically divided into two groups of 8 EVs plus an EV for indicating the condition is associated with a short event if non-zero. The first group holds the slot information for each condition, one EV per condition, the first EV holds the slot information for condition 1 and so on. The second group indicates whether the event polarity is inverted, i.e. whether the ON or OFF event sets the condition. If a slot is used it is indicated by a '1' bit in the slot position. To set a slot condition where an On event sets the condition, select the On option. To set a slot condition with an Off event, select the Off option. Do Nothing removes the event from the condition. EV17 is used when teaching the module to generate a short event, the non-zero value indicates the condition number. A zero value in EV17 indicates that this is a normal consumed event.

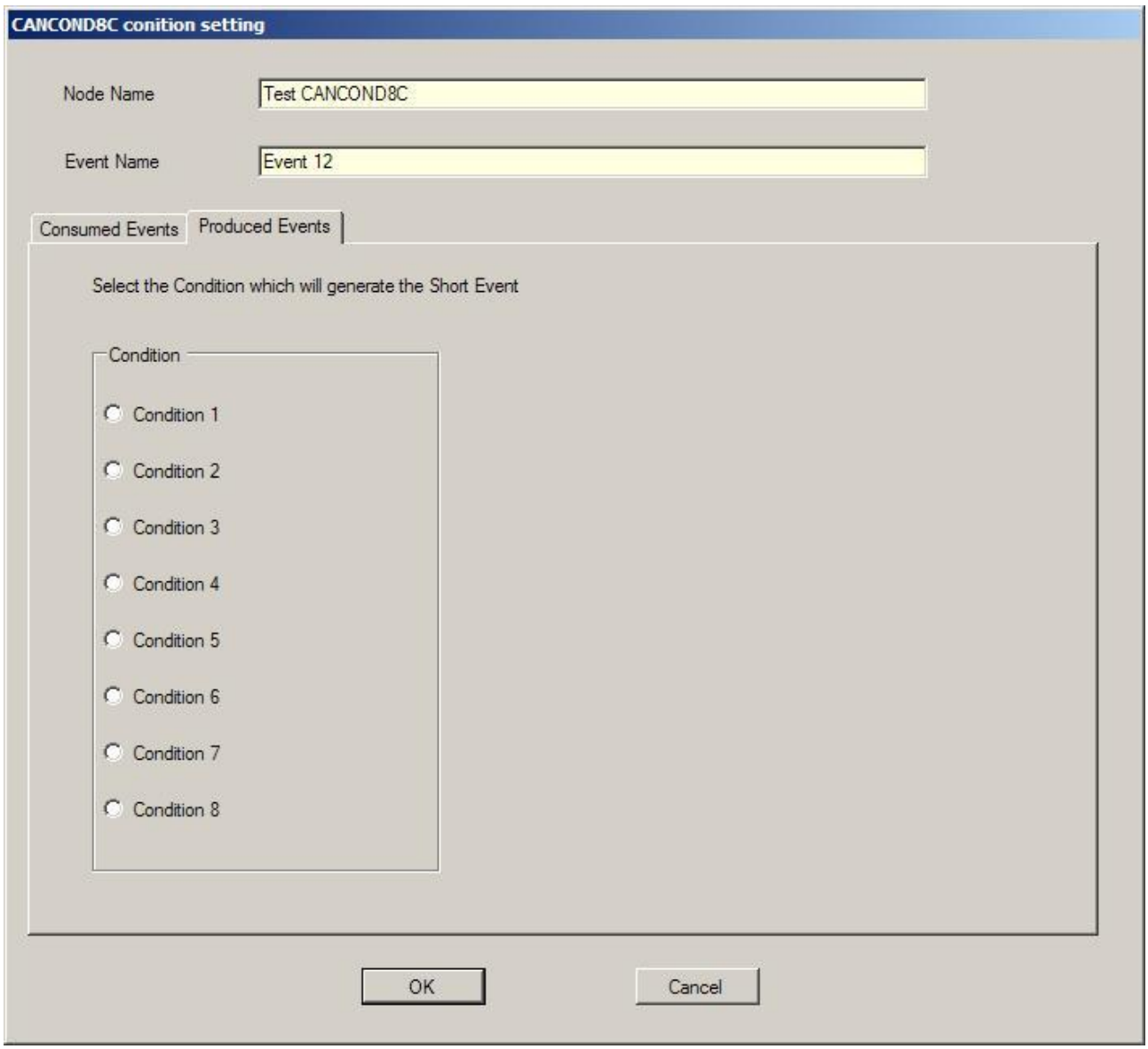


Figure 17. Teaching a Condition to generate a Short Event

Also associated with the condition information are the Node Variables. These are updated automatically when events are taught or deleted. There are 8 NVs, one for each condition. A '1' bit in the NV indicates that the corresponding slot is used by the condition.

2.6.2 Using ON Only Events

There are circumstances where the automatic “slot” allocation does not allow for total control of the condition. This is particularly the case when an event can only exist as an ON event, that is, there is no corresponding OFF event. Both the CANACE3, CANACE3C and the CANACE8C can be configured to generate ON only events.

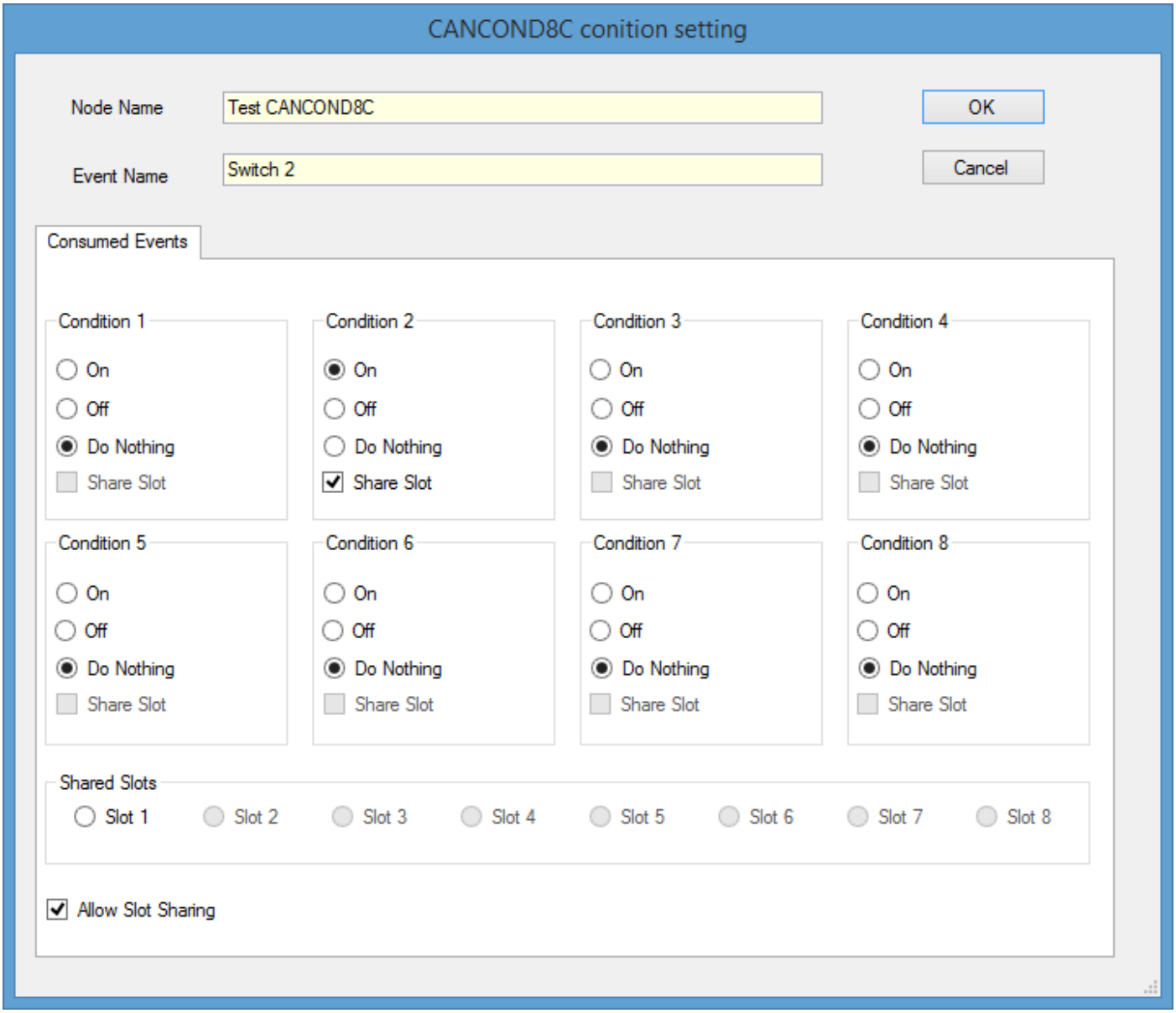


Figure 18. Event Teaching Dialogue with Slot Sharing Enabled.

Where two ON events are logically related, for instance each event may control the position off a turnout, then the two events will need to control the same slot within the condition. One event will need to set condition slot state and the other event will need to clear it. This means that two events need to share control of the slot. This is achieved by selecting the “Allow Slot Sharing” check box. When this is selected, all the Share Slot selection check boxes are enabled, and an additional control panel is enabled. This has 8 radio buttons, one per slot. When the Share Slot check box is selected for the target condition, only the available Share Slots radio buttons will be enabled for that condition.

In the screen shot above, Share Slot is selected for condition 2 and only slot 1 is available for sharing.

2.6.3 Preparing to Teach Slot Sharing.

The first event, which should be the event that sets the condition, is taught normally, do not select Slot Sharing for this event. Choose the target condition and select the On action to set the condition. After the event has been taught, in the Event Grid, move the mouse pointer to the Event Variables column for the new event. The decode of the event variables will be displayed as a tool tip, see the screen shot below.

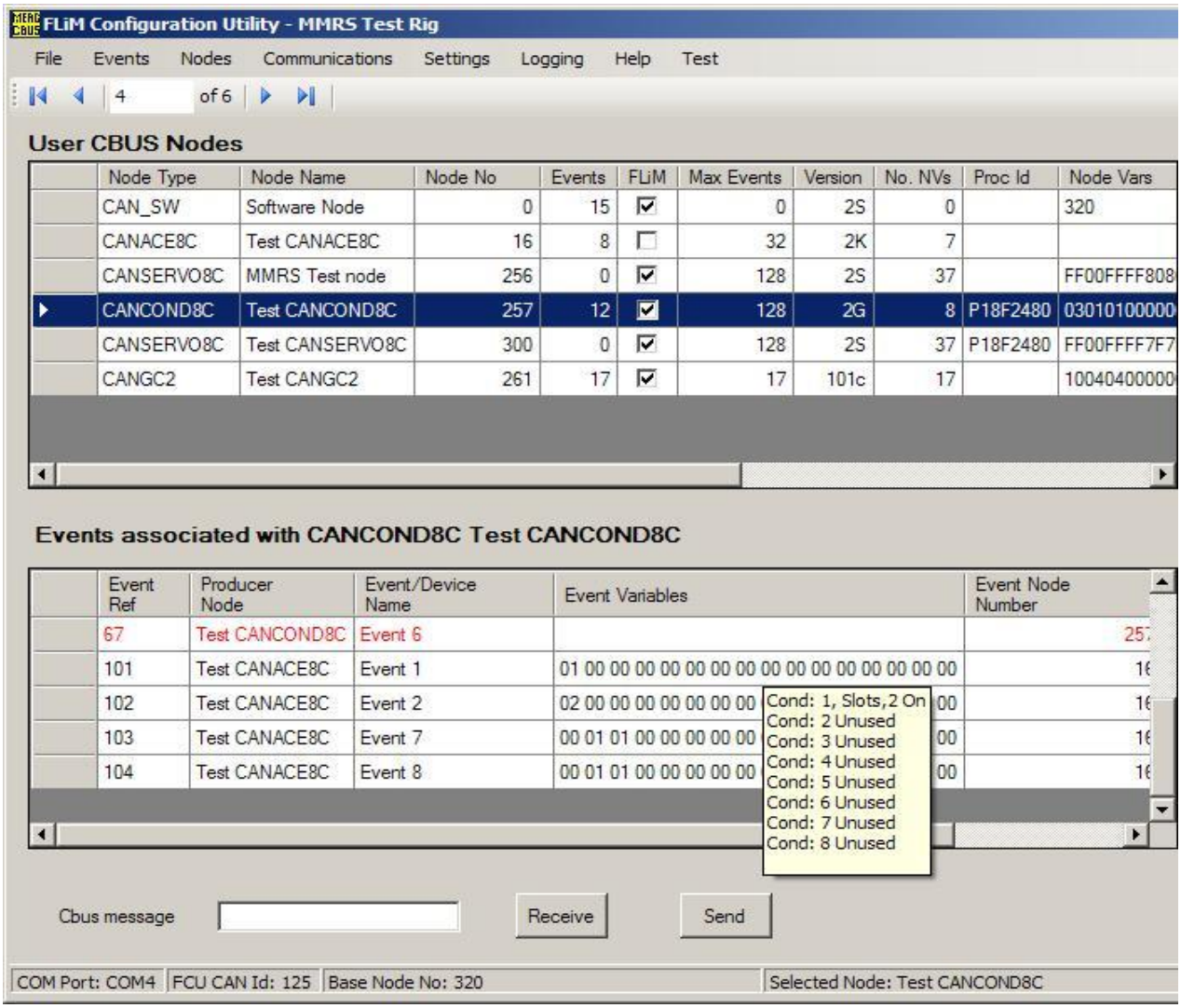


Figure 19. Tooltip showing Event Slot Information

The above screen shot shows a tooltip for Event 2. This indicates that the event is in condition 1 and uses slot 2. Now when adding the second shared event, it must also use the same condition and slot number, but the action must be inverted from the first condition, if the first condition set the condition to be On, this second event must set the condition action to Off, so that the two events together will turn the condition On and Off.

Also notice that Events 7 and 8 both use slot 1 in conditions 2 and 3, as these two events are sharing the same slots in two different conditions.

It is also possible to check the overall use of the condition slots. The screen shot below shows a tool tip for the Node Variables for the CANCOND8C module.

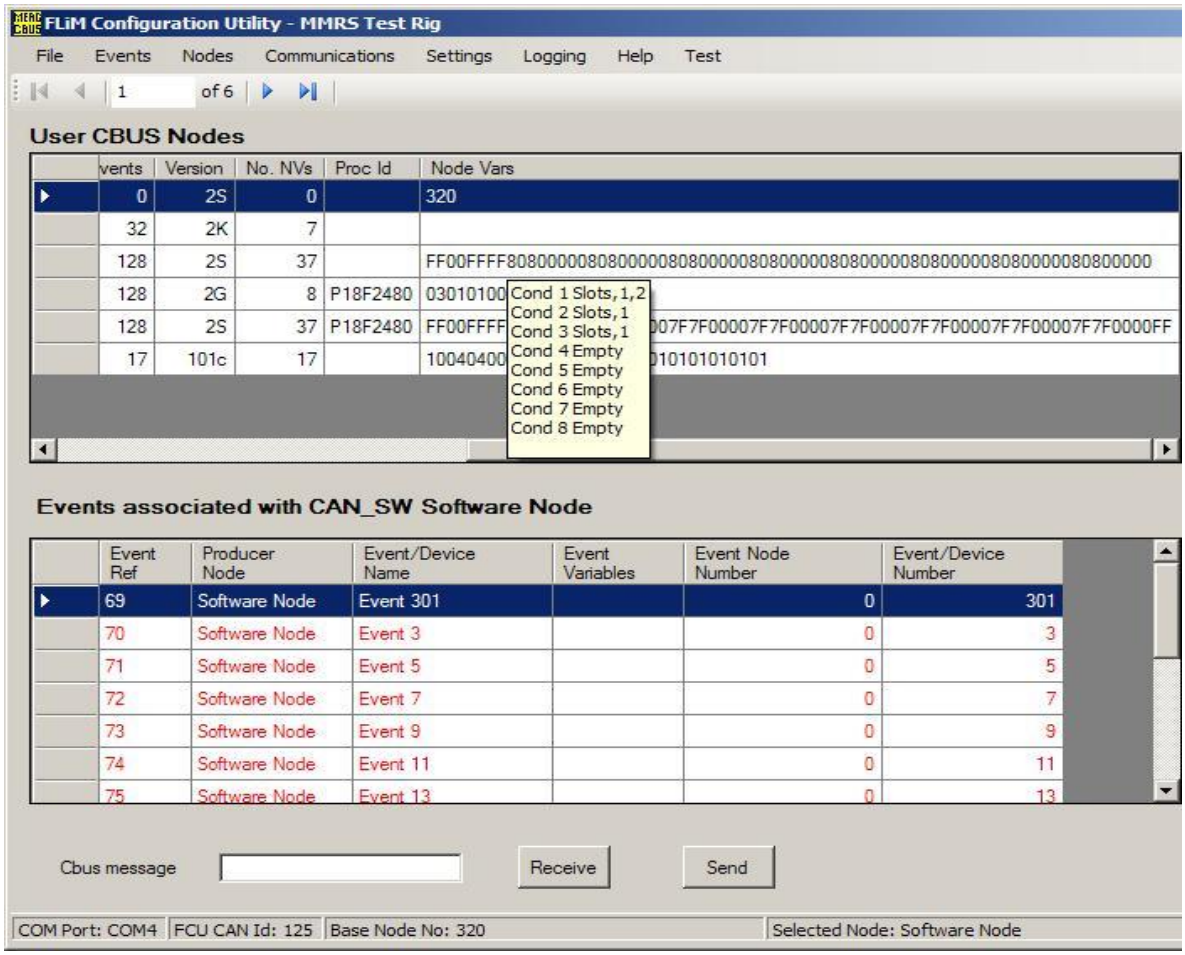


Figure 20. Tooltip showing Node Variable Information

The tool tip shows that there are 3 conditions defined, Condition 1 uses 2 slots, but Conditions 2 and 3 both use 1 slot each, they have been set to use slot sharing.

Node Variables cannot be updated directly for the CANCOND8C as they are automatically updated when an event is taught. However, they can be read and written, but writing should never be necessary.

2.7 The CANSERVO8C, CANMIO-SVO & CANVSERVO

The CANMIO-SVO and CANVSERVO are replacements for the CANSERVO8C and use the PIC18F26K80 PIC. It is functionally identical to the CANSERVO8C, any reference to the CANSERVO8C in the following descriptions apply equally to the newer modules. The newer modules have the additional capability to generate 8 additional events with the MIO-ADD satellite board on the CANMIO, like the CANBIP-OUT and the CANMIO-OUT, and on board with the CANVSERVO.

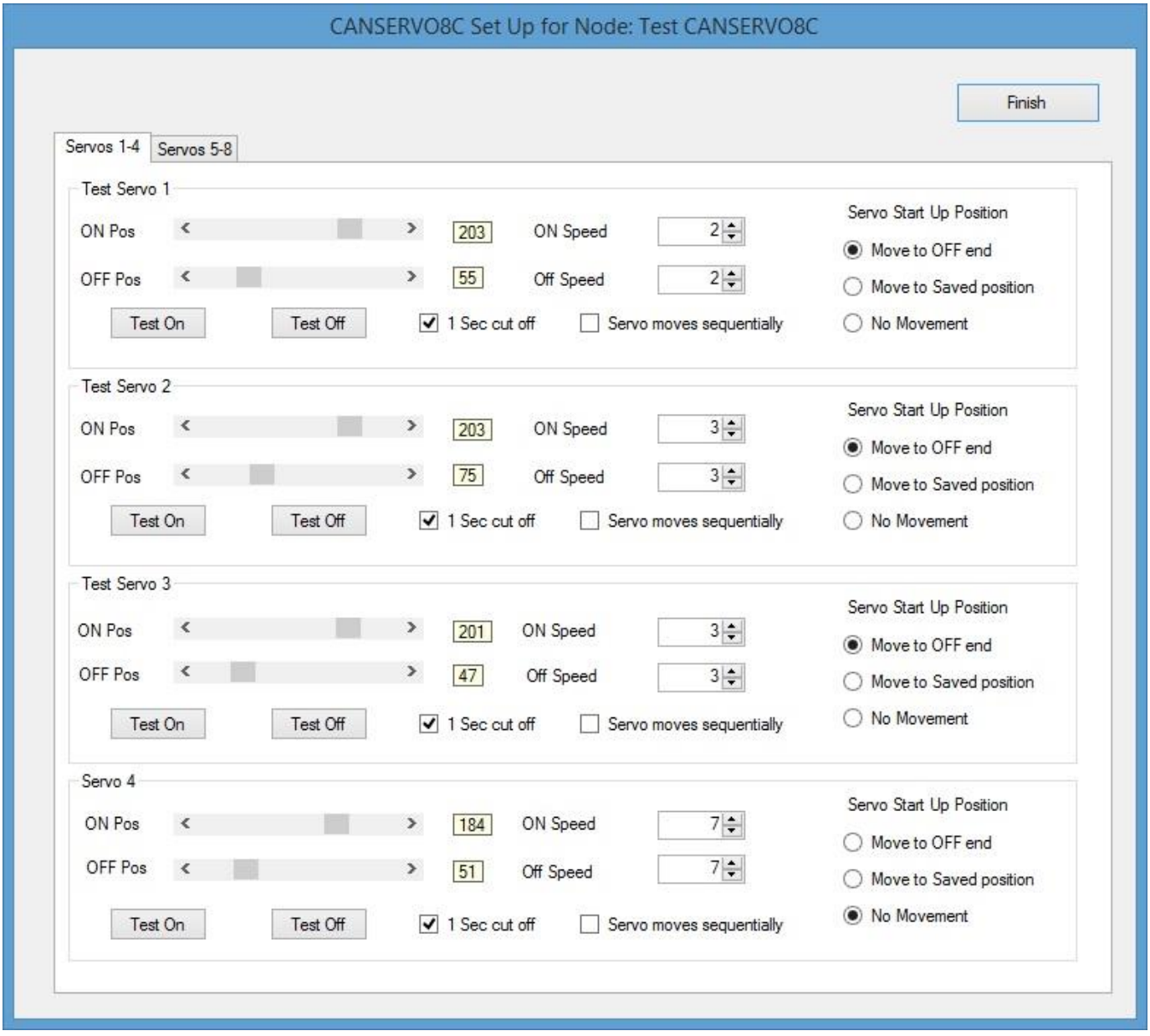


Figure 21. Node Variables

2.7.1 Node Variables

Teaching Node Variables to any of these modules works in real-time. This means that any changes that are made are sent immediately to the CANSERVO8C, CANMIO-SVO or CANVSERVO node so their effects can be seen. You must have read the Node Variables before you can change them; the Nodes/Update NVs menu option is disabled until the Node Variables have been read.

The modules have 8 outputs, each output has its own set of Node Variables as shown above. The “ON Pos” slider adjusts the position the servo will move to on receipt of an ON event, similarly, the “OFF Pos” slider adjusts the position the servo will move to on receipt of an OFF event. The values range from 0 to 255. The “On Speed” and “Off Speed” values range from 0 to 7 and control the speed at which the servo moves, 0 is the fastest, 7 is the slowest. The two Test buttons allow the settings to be tested, they simulate an ON or OFF event. The "1 Sec cut off", when checked, will stop the servo control pulses after 1 second, otherwise the servo will be continuously pulsed. When you are satisfied that all the servos are operating correctly, click the Finish button. The dialogue may be resized to suit the screen size, scrollbars will appear as necessary.

When setting the servo, the **Servo moves sequentially** check box must be unchecked, otherwise the servo will not move while the settings are changed, nor will the Test Buttons operate. This check box should be set, if required, when all settings have been completed for the servo.

Set the check box **Move to OFF end** to cause the servo to move to the OFF position on start up

Set the check box **Move to Saved position** to cause the servo to move to last used position

Set the check box **No Movement** to prevent any servo movement at start up.

The dialogue can be resized to suit the screen size, scrollbars will appear if necessary. Click the **Finish** button to close the dialogue.

2.7.2 Event Teaching

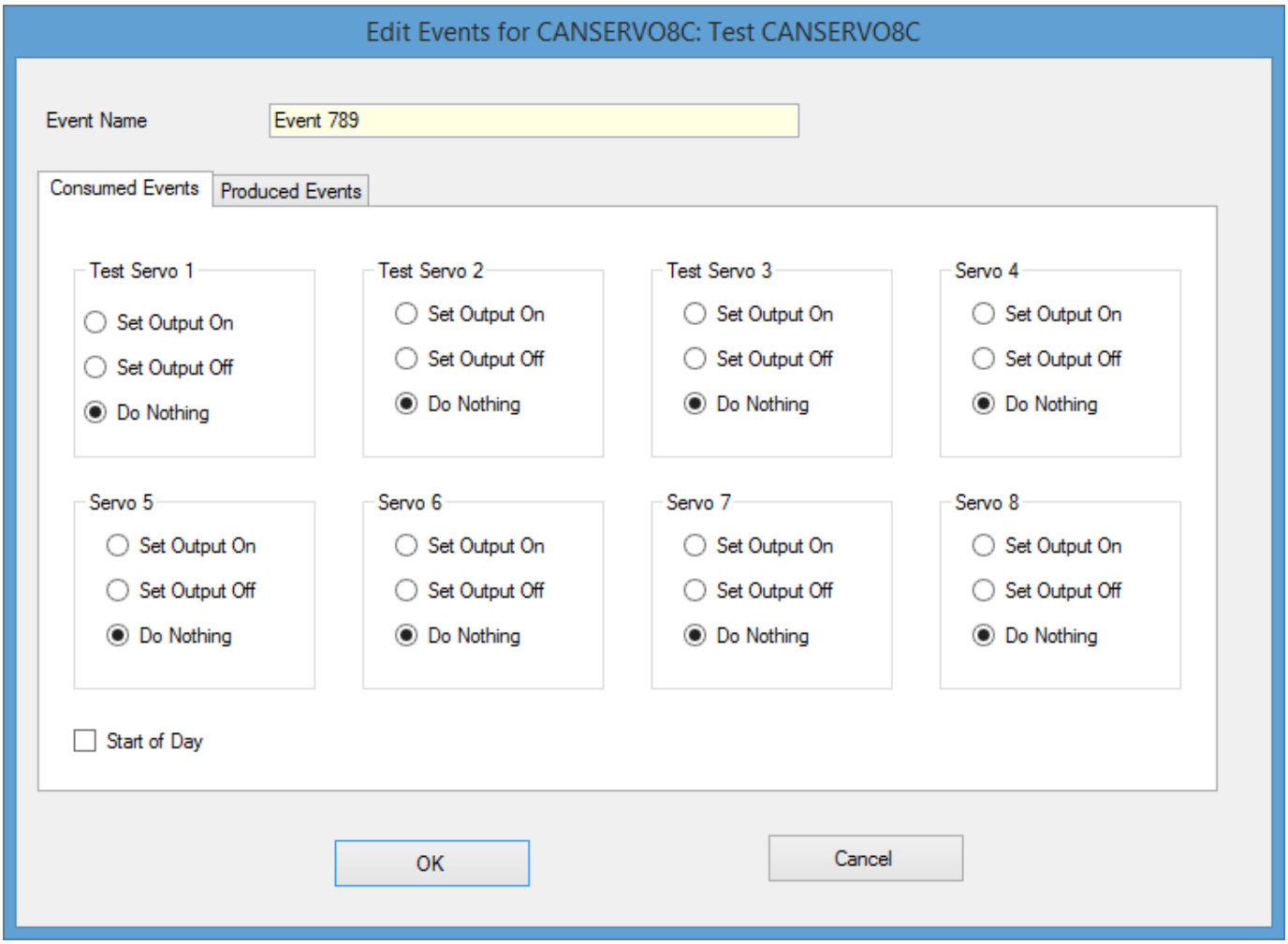


Figure 22. Event Teaching

The modules support both consumed and produced events. Consumed events are events which drive the servos according to the event parameters.

Produced events are events that are generated because of the servo movement.

When teaching an event for the first time, the dialogue above will open,

This dialogue gives the option of teaching the event as either a consumed or produced event, select the relevant tab to choose the event type. The first tab is for consumed events, the second tab is for produced events, see below for a screen shot of the Produced Event tab.

To define the event as a Start of Day event, click the Start of Day check box, all other options will be disabled when this is checked.

When editing an existing event, by double-clicking the event in the Event Grid, then the teaching dialogue will re-open, but will now have only one tab. The tab type depending on whether the event is a consumed event or a produced event.

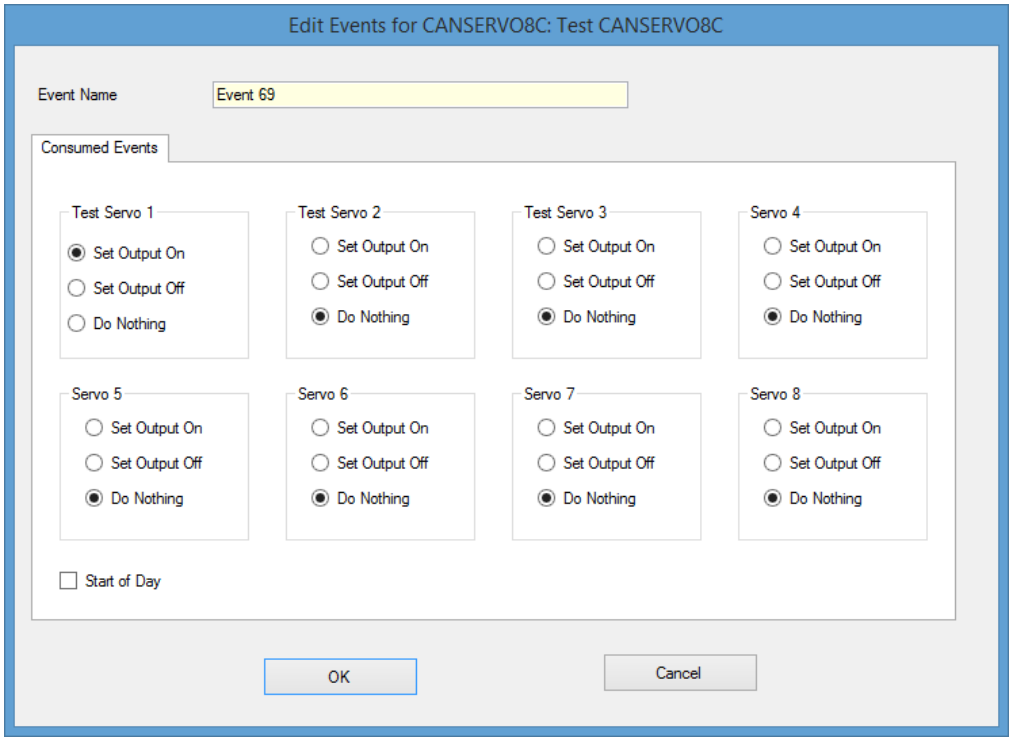


Figure 23. Edit a Consumed Event

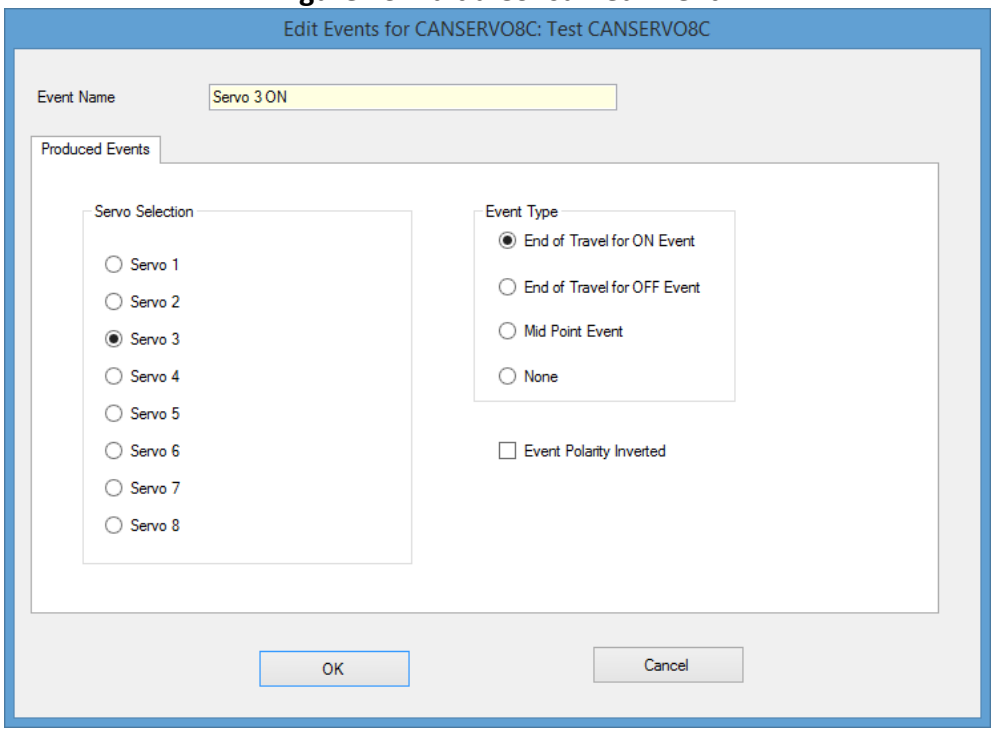


Figure 24. Edit a Produced Event

2.7.3 Produced events.

Select the Servo which is to generate the event and then select the event type.

End of Travel for ON Event – the event will be generated when the Servo has completed the move for an ON event.

End of Travel for OFF Event – the event will be generated when the servo has completed the movement for an OFF event

Note that the generated event will be an ON event when the movement is completed and an OFF event when the servo moves away from its current position. If the Servo is already at the end position an ON event will be generated.

Mid-Point Event – this event will be generated when the Servo moves past the mid-point of the travel. An ON event is generated when the Servo moves towards the ON end and an OFF event is generated when the servo moves towards the OFF end.

None - The action of this option is to delete the event from the CANSERVO8C node, it does not delete the event itself from the configuration. The event will still be associated with the CANSERVO8C node but will not have any event action values set.

If an existing Produced Event is edited, the FCU will delete the event from the node before teaching the new action. This is to ensure that the original event action will be deleted before the new event action is taught.

Event Polarity Inverted – Selecting this option will invert the event generated as described above.

2.7.4 Teaching the MODULE to generate its own long events.

It is possible to teach the module to generate a long event, i.e. ACON or ACOF events, with its own node number as part of the event message. To do this an event must first be learnt by the FCU before it can be taught to the module.

The module can generate 3 events per servo, making a total of 24 possible events, each of the 3 events can generate both ON and OFF event messages. Each event needs a unique event number, these can be from any values between 1 and 65535 chosen by the User. Note that the same event numbers can be used by all similar modules as the full event message also contains the node number of the generating module, making each module produce different events for the same servo action.

Select the module node in the Node Grid and then select Events/Learn. Enter a suitable name for the event and the chosen event number, this can be any number from 1 to 65535 as explained above. Click OK to learn the event. The event should appear in the Event Grid for the selected module. Double click this event and the dialogue box shown in Figure 24 will open. The FCU knows that this event is a producer event. Set the required actions and click OK to teach the event to the CANSERVO8C node.

The node will then produce ACON and ACOF events for the selected action with its own node number in the event message when the relevant servo moves.

2.8 The CANPAN Module

The CANPAN is a CBUS module which combines the functionality of a CANACE3 and a CANLED64 into one module, but with reduced facilities. The CANPAN supports 32 switches or push buttons and 32 LEDs. Each switch can be individually configured to act in one of four ways.

1. ON/OFF Toggle Switches – with an option to invert the event polarity
2. ON only Push Buttons
3. OFF only Push Buttons
4. Push Button Toggle – the Push Button alternates between ON and OFF events.

2.8.1 Node Variables

There are four options for the CANPAN Node Variables, the options specify the action of the CANPAN on start-up.

1. Do Nothing
2. Last State
3. All On
4. All Off

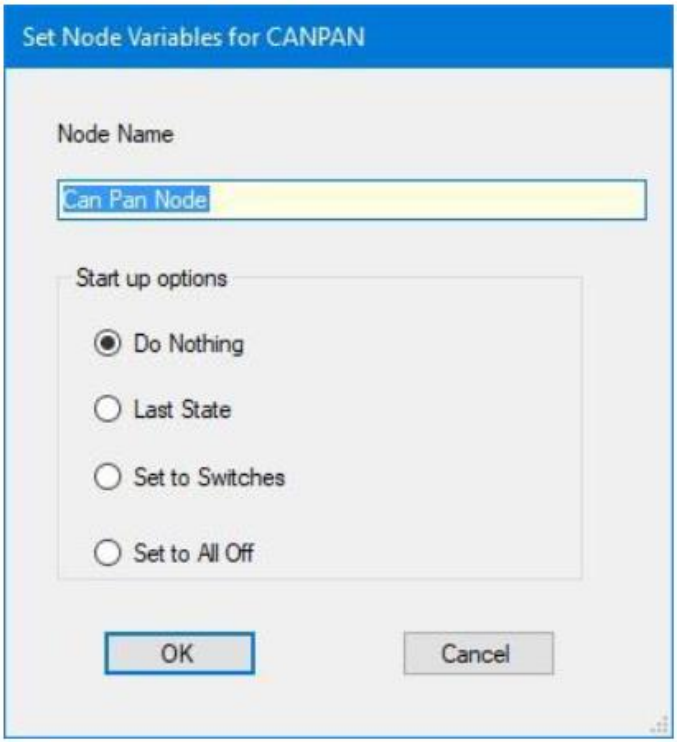


Figure 25. Node Variables

2.8.2 Teaching Events

Note that the default setting for a virgin CANPAN is ON/OFF Toggles but the FCU does not assume that this is the behaviour of a new switch event. The CANPAN switch behaviour can only be configured in FLiM mode. The LEDs can be configured to respond to normal ON and OFF events, ON events, OFF events or set to Flash, this is the same behaviour as the CANLED64. After the node has been added to the configuration, all the connected switches should be operated to add the event associated with each switch to the configuration. The Event Grid will show each switch event as it is added, the event value is the actual switch number. As each switch is added, edit the event to give the event a meaningful name. To do this simply right-click the event and then select Edit Name from the popup menu.

When all the switches have been added to the Event Grid with suitable names, each switch needs to be configured. To configure a switch, that is to define the actual switch behaviour, right-click the event associated with the switch and select Edit Event, a dialogue will open, see

Figure 26. There are three tabs in this dialogue, the first tab allows the switch behaviour to be changed. The second and third tabs control the behaviour of the LEDs for this event and offers the same facilities as the CANLED64.

Select the required switch behaviour and, optionally, any LED behaviour and then click OK. The FCU now treats the switch as configured. Switches must be configured before they can be used by the CANPAN itself, for instance to allow the CANPANs own events to control the LEDs.

If the switch action for the switch is set to ON/OFF Push Button, the CANPAN will monitor received events for the same event now generated by the switch and update the toggle action to keep it in step with the event status. For instance, if the PB last generated an ON event, it would normally generate an OFF event on the next press. But if an OFF event is received for the switch event, the next press of the PB will generate an ON event.

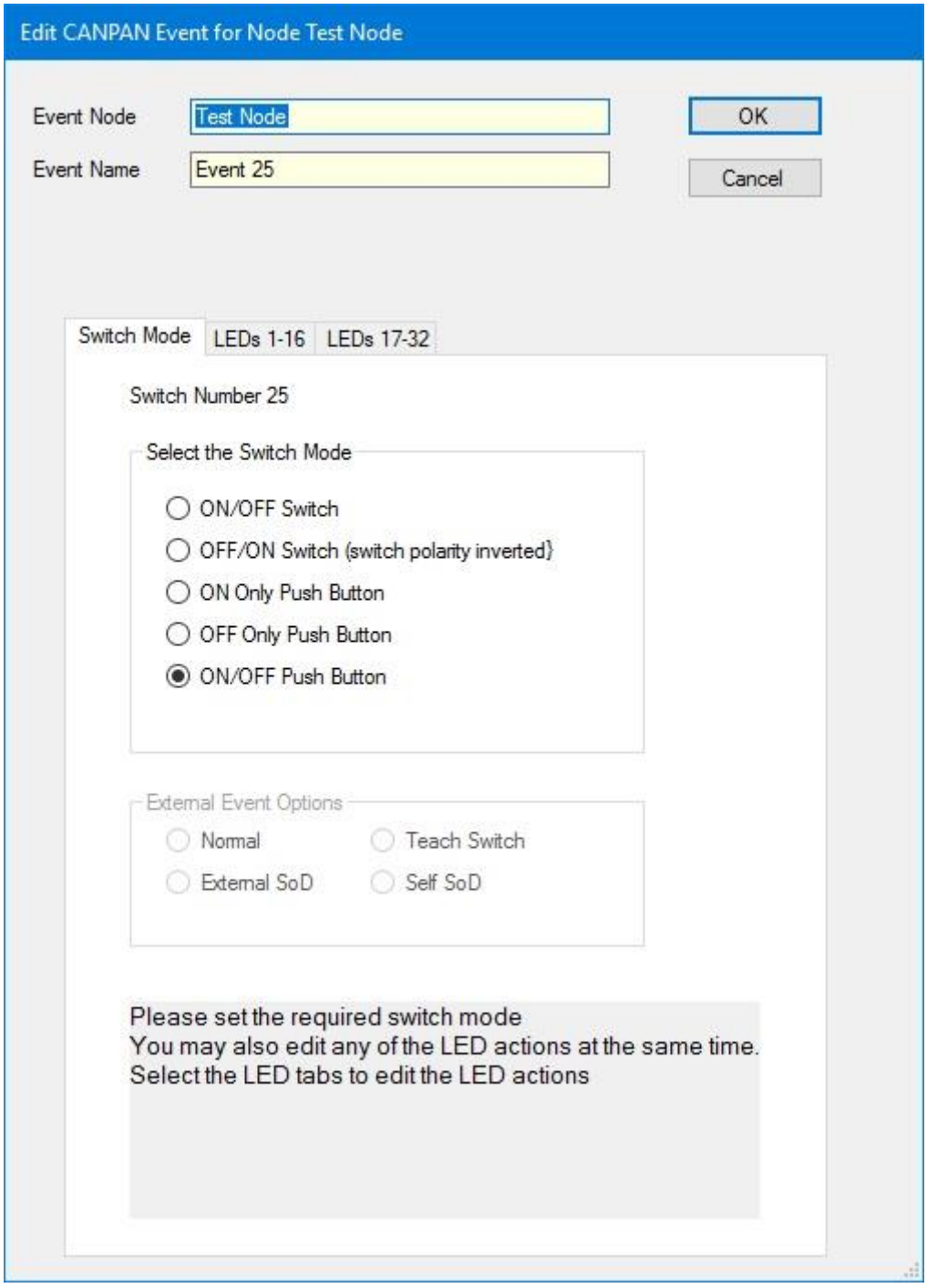


Figure 26. Initial Switch Configuring

All switches on the CANPAN must be configured before they can be used, these are local events. Operate each switch in turn, this will result in an event appearing in the Event Grid for the CANPAN. Give the event a suitable name by right clicking the event and choose Edit Name from the pop-up menu and then repeat the process and select Edit Event from the pop-up menu. The dialogue shown above will appear. Note that as a switch is a local event, the External Event Options are disabled

Select the appropriate mode for the switch, and any required LEDs (if known), then click OK. The event can be edited again later to add any LEDs.

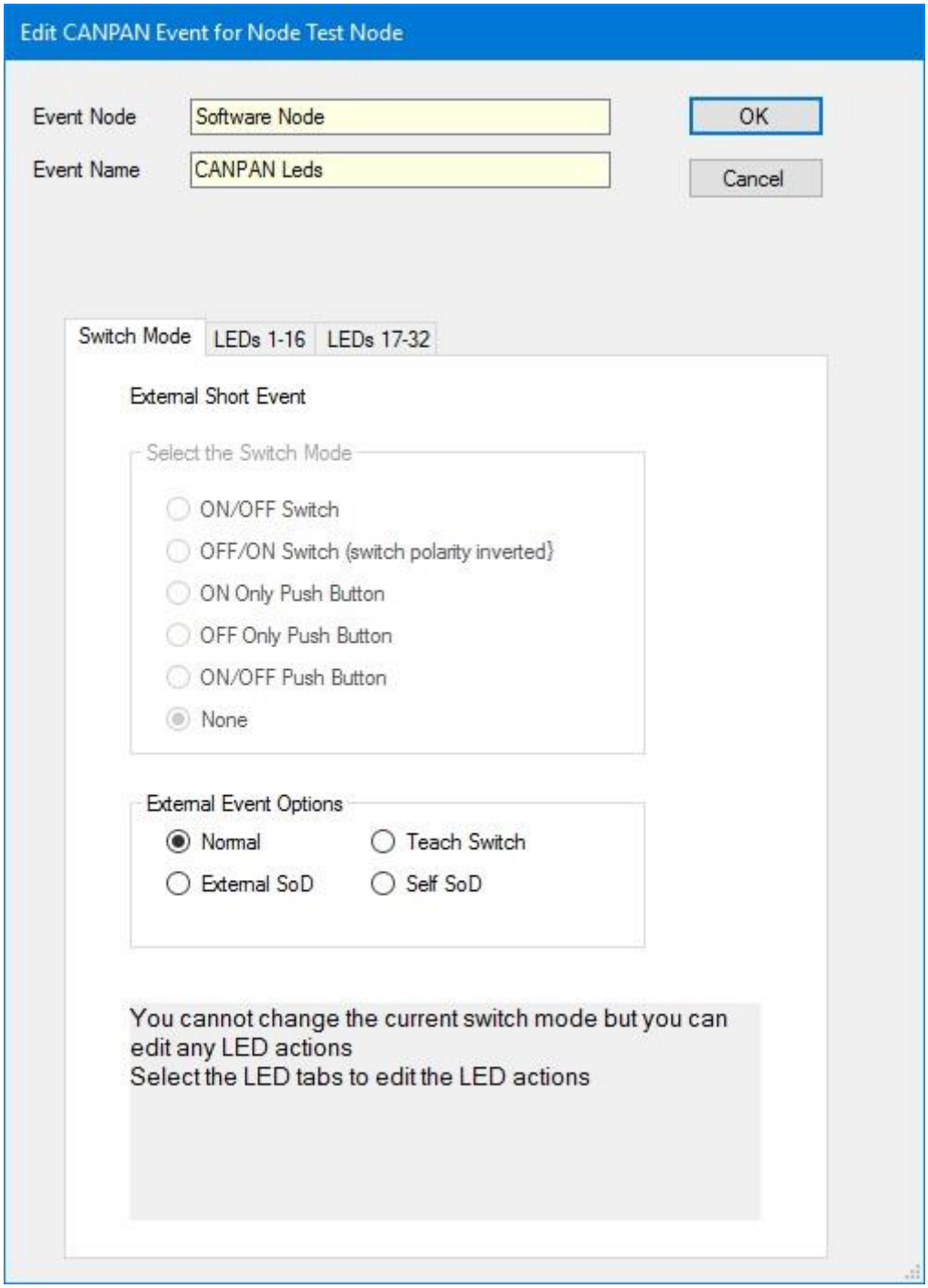


Figure 27. Teaching an External Event

External events are added by dragging and dropping the event from the source module Event Grid onto the CANPAN node in the Node Grid. The above dialogue opens, and the External Event Options box is now enabled. The switch mode will only be enabled for events that requite a switch mode to be set, currently the only options that requires a switch mode are Teach Switch & Self SoD. The Normal Option is used to add an external event which controls the LEDs. The External SoD Option is used to add an event that causes the CANPAN to generate its current switch states.

The Self SoD option is only enabled when the External Event is a short event. The event is taught to a switch and when this switch is operated, it causes the CANPAN to generate its current switch status. In addition, the CANPAN also transmits the switch event onto the CBUS network so other modules can also respond to the event as a request for Start of Day status.

When teaching an external event to a switch, a dialogue (see Fig 42) , will be displayed asking for the target switch to be operated within 10secs.

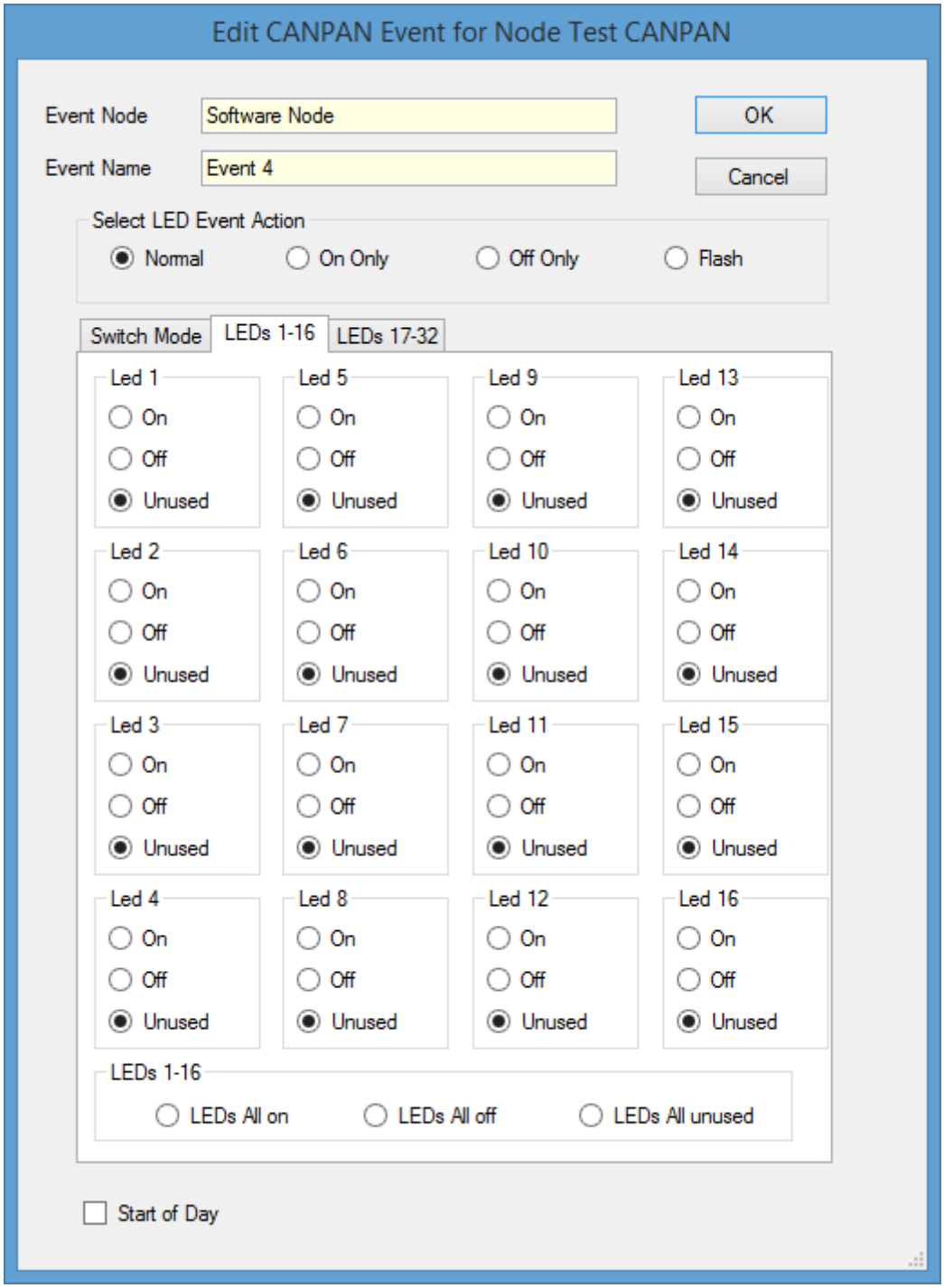


Figure 28. Teaching the LEDs

Select the tabs that contains the target LEDs and then set the required actions. These are the same as the actions used by the CANLED64.

2.8.1 Teaching a Switch to Generate a Different Event

It is possible to teach any switch to generate an event different from the default. This feature is primarily used to teach a CANPAN switch to generate a Short Event but can be used for any event from another node. Any required LED actions can also be set, but in this case, the switch action must also be set. The switch action must be selected to teach a switch to generate a different event. This time select the required switch action and click OK.

As the target switch is not known, after clicking OK, a message box will be displayed asking for the target switch to be operated. Click OK in the message box and operate the target switch within 10 seconds. This action allows the FCU to recognise the target switch and teach the new event to the switch. To abort the activity, click Cancel in the message box. Note that this process is the same as that used for teaching events to switches for the CANACE3 and CANACE3C.

2.9 The CANLED64 Module

2.9.1 Teaching Events

The CANLED64 does not have any Node Variables.

Note that the LEDs are numbered from 1 to 64. To teach a CANLED64, select the Tab which contains the target LED and choose either On or Off. If On is selected, an ON Event will turn the LED on and an OFF Event will turn the LED off. If Off is selected the action is inverted, an ON Event will turn the LED off, while an OFF Event will turn the LED on. Select Unused to remove the LED from the event. Repeat as necessary, selecting the correct Tab for any additional LEDs. When all LEDs have been selected, click OK to teach the event.

There are also three radio buttons on each tab, each radio button allows all LEDs on the Tab to be set On, or Off or Unused. Only one radio button may be selected at a time.

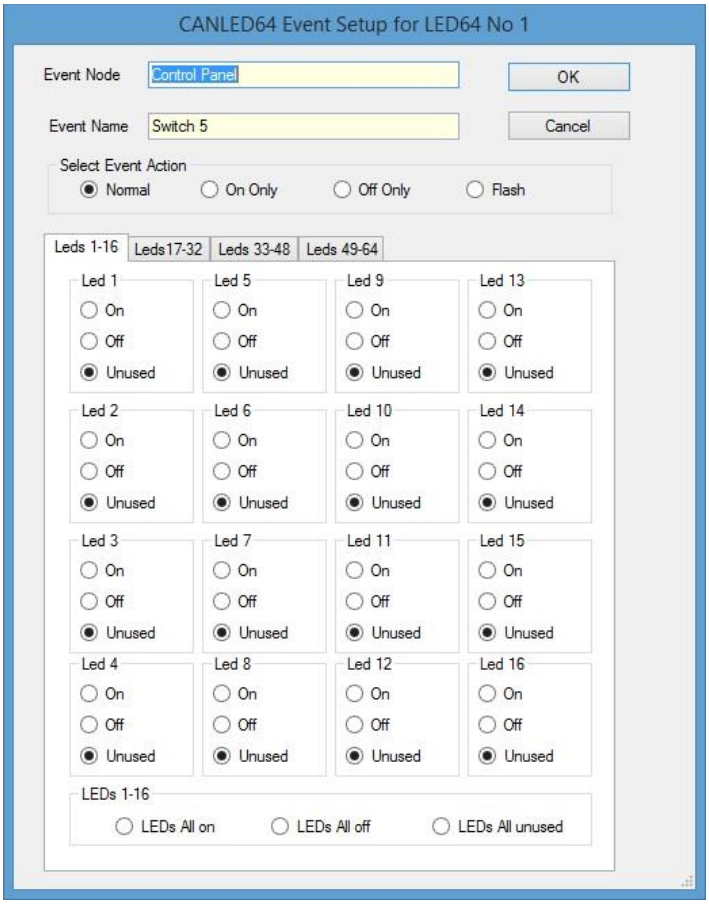


Figure 29. Event Teaching

The “Normal” option allows both On and Off events to control the nominated LEDs, for the “On Only” option, only On events will be actioned, similarly for the “Off Only” option when only Off events will be actioned. The “Flash” option enables On events to start the specified LEDs flashing, an Off event will stop the LEDs flashing. Individual LEDs selected for On will flash in anti-phase to individual LEDs selected for Off. See Appendix 4 for the relationship between LED numbers and the 'D' connector pins. The dialogue can be resized to suit the screen size, scrollbars will appear to allow the dialogue to be scrolled.

2.10 The CANCMD

2.10.1 Support for NV Settings in CANCMD

Users must be familiar with the document “CBUS DCC Command Station FLiM Programming” by Pete Brownlow.

Note that NVs must be read first before they can be updated. The CANCMD supports 144 NVs, however the FCU only displays the first 16 NVs in the Node Grid as only these NVs affect the behaviour of the CANCMD. The remaining 128 NVs access the shuttle table and are only accessible via the generic dialog option when firmware version 4f or greater is installed.

The NV setting dialogue has two Tabs. The first Tab labelled “Settings” is for normal Users without detailed knowledge of the CANCMD. The second Tab labelled “Advanced” is specifically for CANCMD experts. Do not make any changes to data in this Tab unless you know exactly what you are doing.

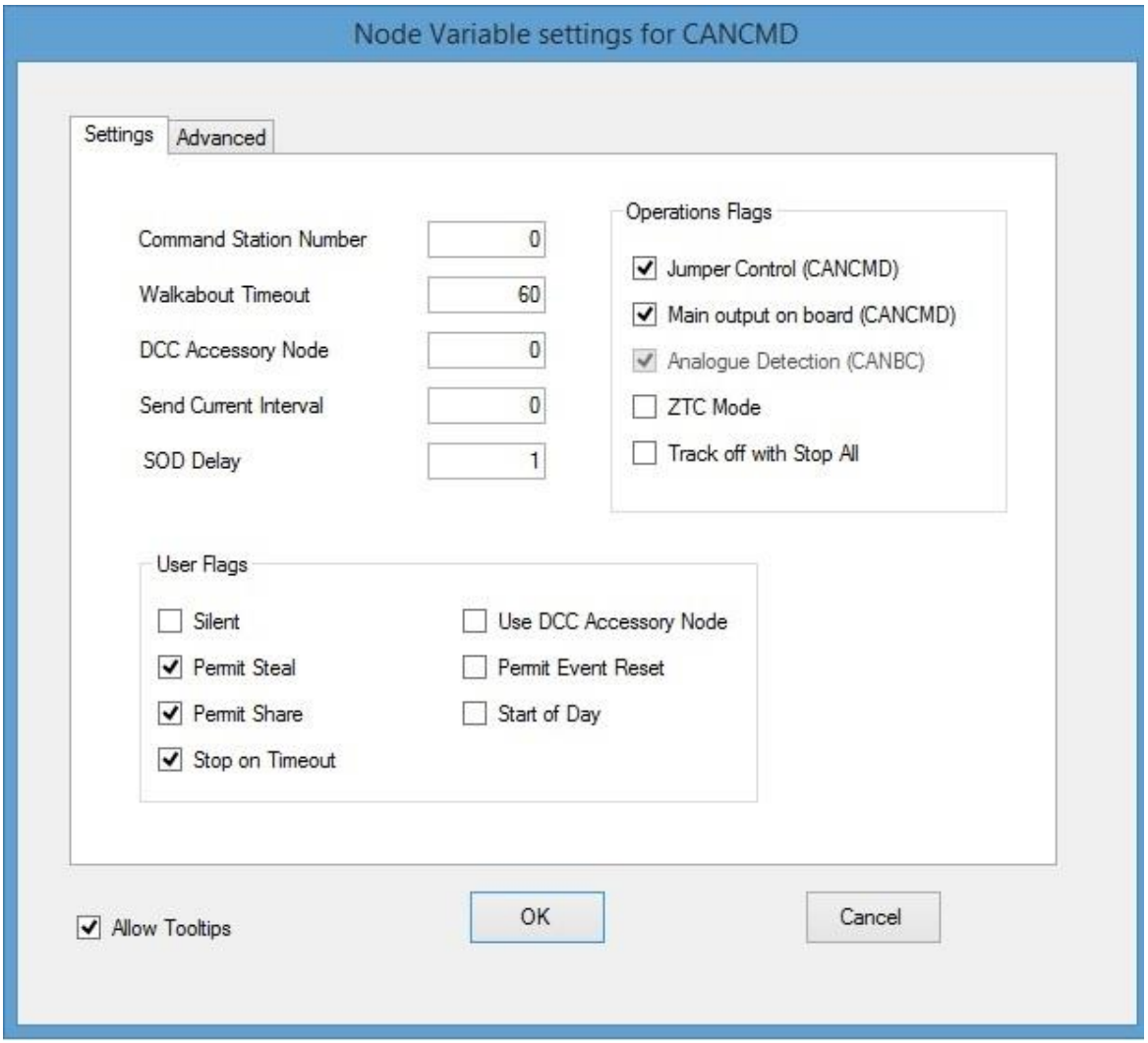


Figure 30. Node Variables Settings

The FCU displays Tooltips when the mouse enters any text box or check box in the dialogue, these are on by default. However, they can be turned off by unchecking the Allow Tooltips check box if desired.

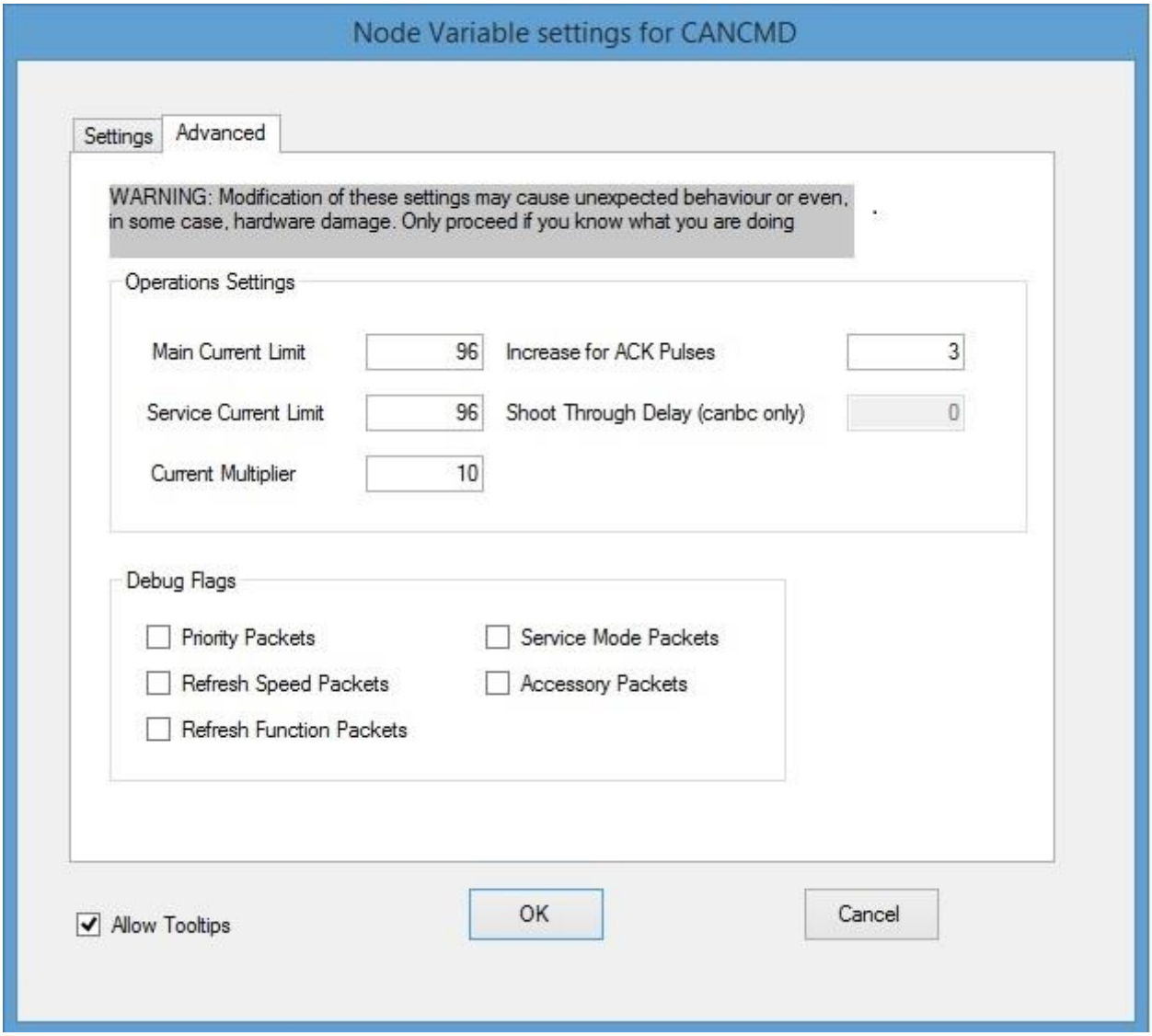
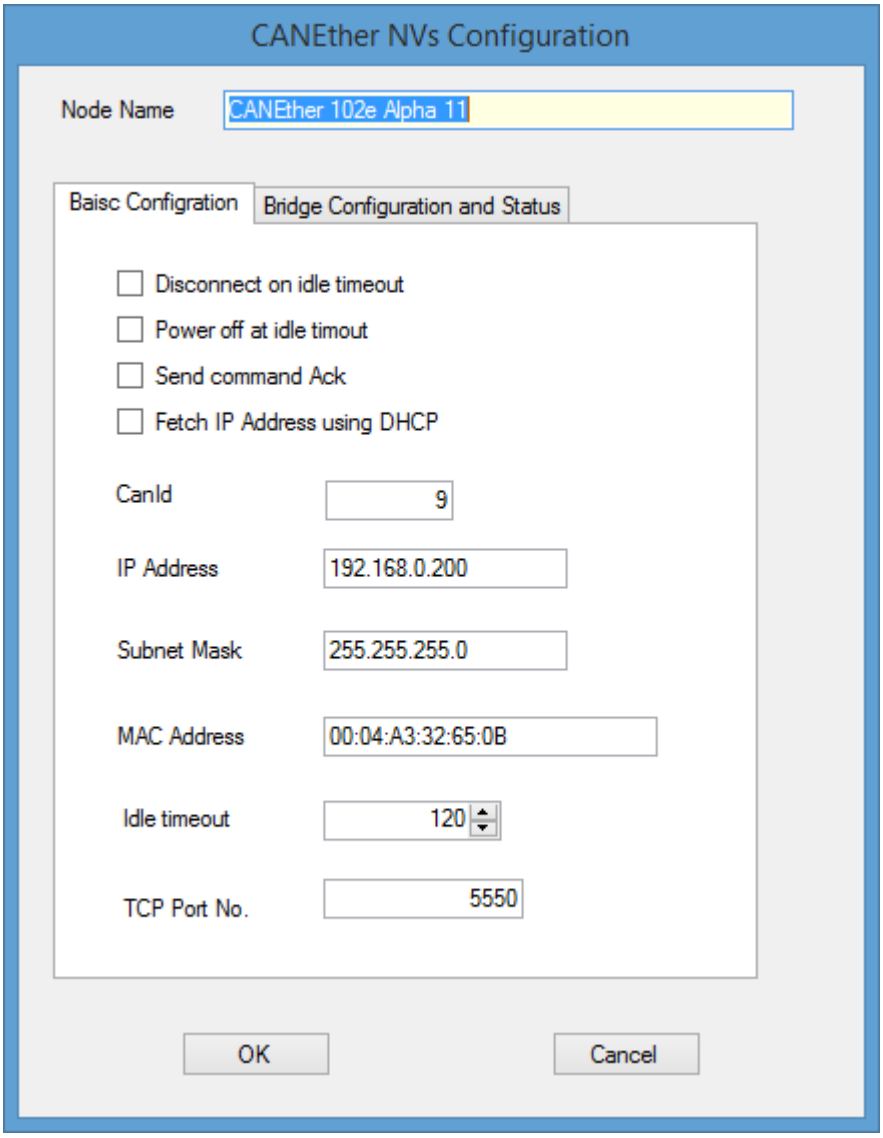


Figure 31. CANCMD Advanced Node Variables

2.11 The CANEther & CANEther-T



CANEther Node Variables 1

TCP Port No is not shown for early versions of the CANEther that do not have the additional NVs.

This is a provisional example of the Node Variables settings dialogue which applies to the Rocrail CANGC1e and the new MERG CANEther board. The following information is provisional and subject to change.

FCU is compatible with the CANGC1e from firmware version 2e onwards.

On a CANGC1e you must fit link JP2 for FCU compatibility, remove this link to be able to configure from Rocrail.

On a CANEther, fit LK1 for FCU compatibility, remove this link to be able to configure from Rocrail.

The first three check boxes are for use with features supported by Rocrail control software. For use with FCU and JMRI, leave them un-ticked.

2.11.1 CANEther Node Variables

Disconnect on idle timeout
Tick this box only if the software you are using sends “keep alive” Ethernet messages. FCU and JMRI do not send these messages, it is believed that Rocrail does so only tick this box if you wish to use this feature with Rocrail.
Power off at idle timeout, **Send Command Ack**
As above, only tick these boxes if you wish to use these features with Rocrail.
Fetch IP Address using DHCP
Set the check box if you want the IP address to be set automatically by a device on your network. This would usually be your router. Note that if you use this feature, you will need to interrogate your router to find out what IP address has been assigned.
CANid
Up to firmware version 2e, the CANid is fixed. You should normally leave this unchanged, with the exception that if you have more than one CANEther/CANGC1e on your CBUS, then you should change this on one of them so that each has a unique value.
From firmware version 2f, the CANEther and CANGC1e uses the CanId enumeration scheme to allocate a CAN Id, so you should never need to change this value.
IP Address
This value is **NOT** used if you have ticked the Fetch IP Address using DHCP box above.
Set this to an address within your Ethernet subnet. This means that the first, second and third numbers must be the same as your router and other computers on your network, the fourth number must be different to your router and any other device on your network.
The IP Address can be changed if your network uses a different default for its intranet connections. However many routers default to 192.168.0.1, in that case the default should work in most cases.
Subnet Mask
Only change the subnet mask from the default value of 255.255.255.0 if you know about networking and have good reason to change it.
MAC Address
If you have a CANEther circuit board revision D or later with a MAC chip fitted, and firmware revision 2f or later, then the MAC address is fully automatic and need never be altered here.
If you have a CANGC1e or an earlier CANEther (or have not fitted the MAC chip), then the MAC address is fixed to the value shown here. The only time you need to change this is if you have more than one CANEther or CANGC1e on your Ethernet, when you must change the MAC address for one of them to a different value. We suggest increasing the last number by one.
Idle Timeout
This is the timeout period, in half second units, that is used **ONLY** if the Disconnect on idle timeout and/or power off at idle timeout check boxes are ticked. See the notes above about these options.

TCP Port No

This is the port number the CANEther will listen on, the default value is 5550. This value should only be changed by someone with networking knowledge who may have a particular reason to change it.

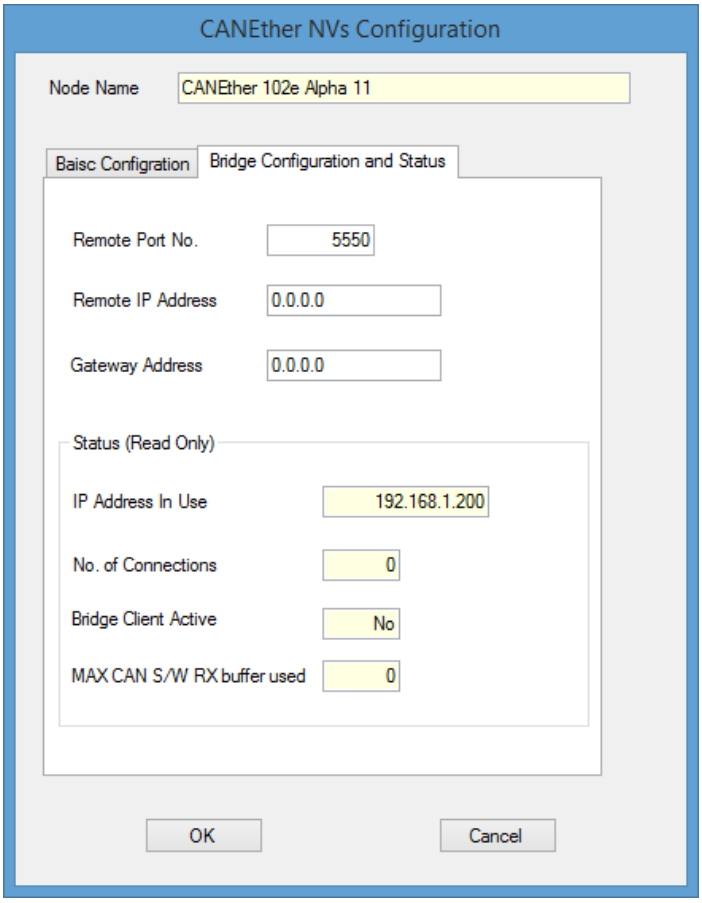


Figure 33 –Node Variables 2

Remote Bridge Port Number

When setting up a bridge, on the client module only, set this value to the port number of the remote bridge. This would normally be 5550.

Remote Bridge IP Address

When setting up a bridge, on the client side only, set this value to IP Address of the remote bridge. The default value is zero which means no bridge is configured.

Gateway Address

This is the address of the gateway, usually the address of your router, if the remote bridge is on a different subnet than the client. The default value is zeros which means no gateway address is set. If the CANEther module is not configured as bridge client, this value need not be set, nor is there any need to set it if the client module and bridge are on the same subnet.

Read Only Data

IP Address in Use

This is the IP Address that the module is currently using. It will be the same as the IP Address on the Basic Configuration tab if a static address is in use. If a dynamic IP Address is in use this field will show that address.

No of Connections

This field shows the number of active Ethernet connections.

Bridge Client Active

This field indicates that the module has an active bridge client.

Max CAN S/W RX Buffer Used

The CANEther module stores incoming CBUS messages in an on chip buffer which holds 8 messages. In addition a further 32 message can be stored in a software message buffer. This field indicates the highest number of software buffers that have been used since the last device reset. A value of 0 indicates that only the hardware buffers have been used.

2.11.2 Discovery Mode

A new facility is being introduced into the CANEther. This enables the CANEther to broadcast a special 'Discovery' message that enables suitable software to recognise a CANEther. This message is broadcast at regular intervals. The FCU can be set to listen to these messages by selecting the Communications/Find Ethernet Connections menu item. When a message is received for the first time from a specific IP Address, a Message Box will be displayed showing details of the CANEther that sent the message.

A list of all detected CANEther nodes can be displayed by selecting menu item Communications/Show Ethernet Connections, a dialogue similar to the one below will be displayed. This will show all detected CANEther and CANGC1e nodes. Note that this menu option only appears after the Find Ethernet Connections menu item has been selected.

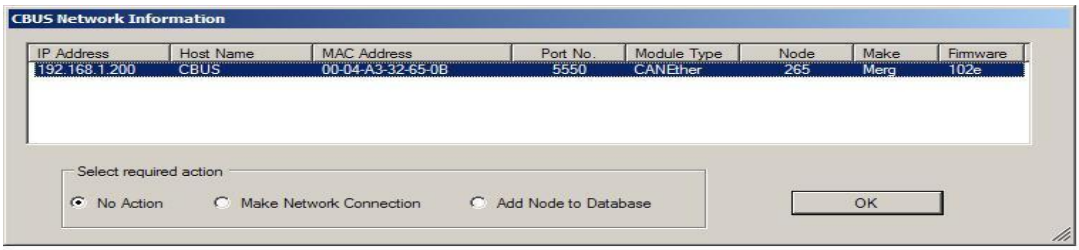


Figure 34. Discovery Mode Dialogue

The Select required action panel is only enabled if there is sufficient data to allow the selected action to be performed. Select the required entry, if more than one, and then choose the required action. If Add Node to database is selected and the node already exists, the node will not be added to the database. Additionally, if the node is not a CANEther, a warning message will be displayed.

If a node is reset using the Nodes/Rest Node menu item, the list of known connections, shown above, is cleared and re-created. This enables any changes that have been made to a CANEther node will be shown in the above dialogue when the corresponding 'Discovery' message is received.
Note these changes also apply to the Merg CANGC1e firmware.
Please note that this is still work in progress for both the FCU and the CANEther/CANGC1e.

2.12 The CANSIG

Each CANSIG module can control up to four signals; these may be two aspect (or semaphore) signals, three aspect signals or four aspect signals.

CANSIG can also support two ‘routed’ signals (Signal 1 and Signal 3) which will have different aspects depending on a ‘route’ setting – this would normally be set from a point position. Routed signals can also display a ‘feather on’ or 'feather off' indicator to show the route set.

2.12. 1 CANSIG Node Variables

Signal 1 Routed - If checked, Signal 1 is ‘routed’ using Signal 1 / Signal 2 events.

Signal 3 Routed - If checked, Signal 3 is ‘routed’ using Signal 3 / Signal 4 events.

Display route with a Red aspect

Normally, a feather or other route indication will not be displayed with a Red signal aspect. If this is checked, the feather or other route indication will always be on if a route is set.

Extended Mode 3 - This is not currently used, leave unchecked.

Leave all the boxes unchecked for a standard four signal (unrouted) setup.

Auto Timers

The Timer Mode Parameters allow 3 and 4 aspect signals to be used when insufficient TOTI indications are available. Any timed output is automatically cancelled if another event is received for that signal.

Red->Green Time

If this is non-zero, and a signal changes from Red → Green, a Yellow aspect will be automatically displayed for this number of seconds. Once this time expires, a timed Yellow → Double Yellow transition will be actioned if the *Yellow-Green Time* is also enabled.

Yellow->Green Time

If this is non-zero, and a signal changes from Yellow → Green, a Double Yellow aspect will be automatically displayed for this number of seconds.

Extended Configuration - This is not currently used; leave set to 0.

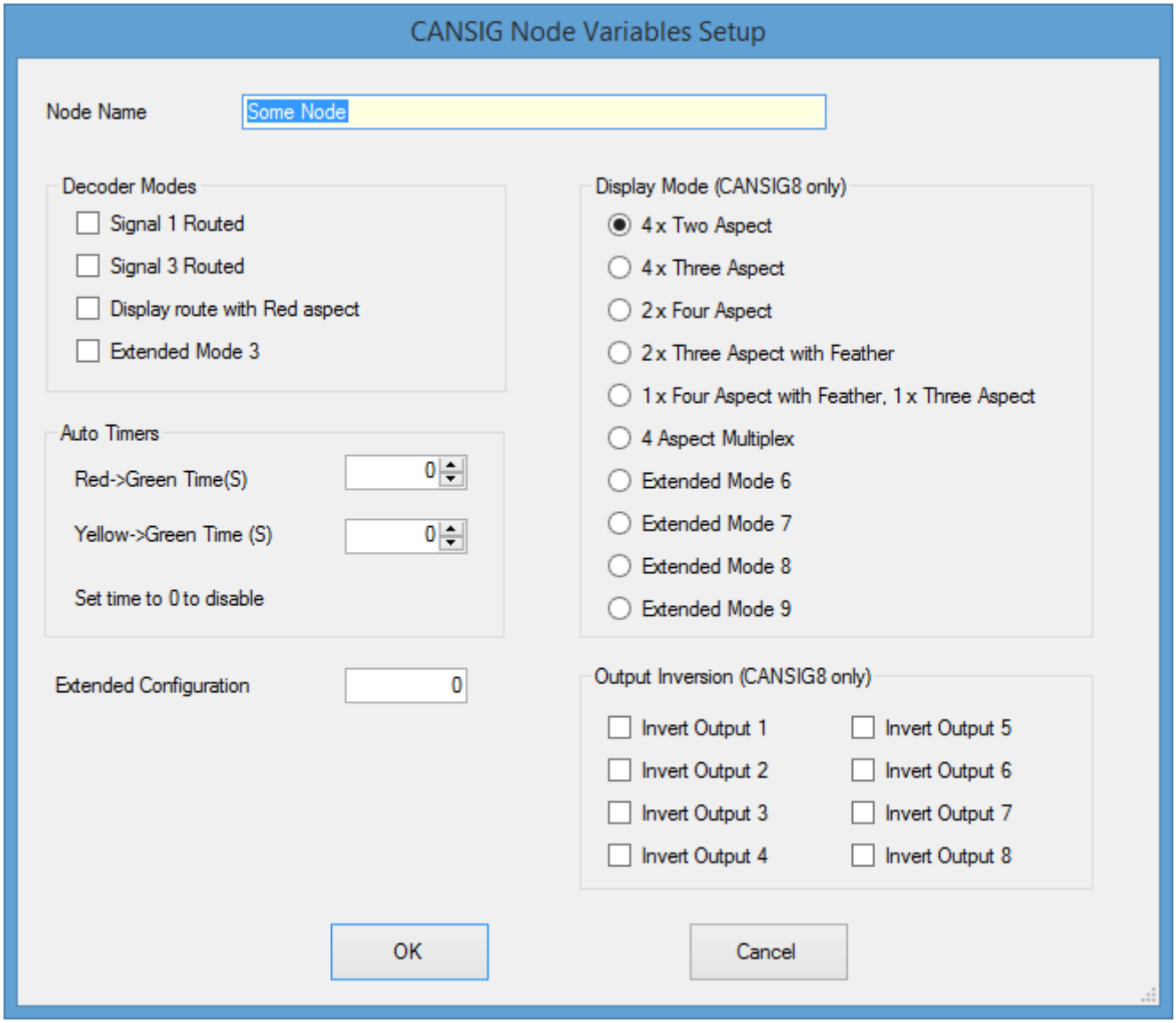


Figure 35 - Node Variables

Display Mode (CANSIG8 Only)

This parameter is only relevant for the CANSIG8 firmware, and controls how the signals are connected to the eight output pins.

Extended Modes 6-9 -These are for future firmware releases.

Output Inversion (CANSIG8 Only)

This parameter is only relevant for the CANSIG8 firmware and allows the polarity of any of the eight outputs to be inverted if the relevant box is checked.

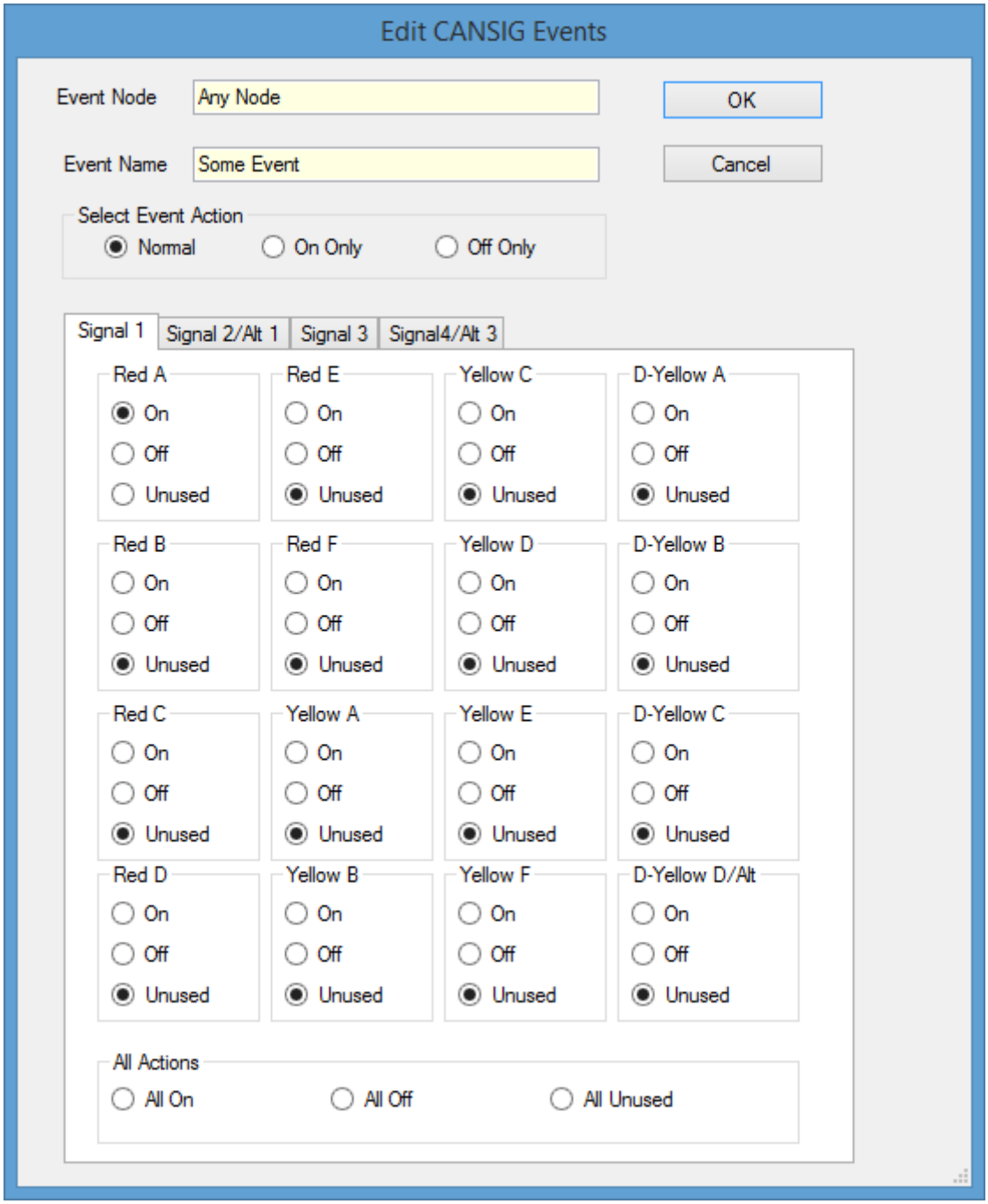


Figure 36 - Event Teaching

2.12.2 Operations Guide

2.12.2.1 Routed Signals

Pairs of signals can be combined to support ‘routed’ signals. These will have different aspects depending on a ‘route’ setting event – this would normally be controlled using a point setting. Routed signals can also display a ‘feather on’ or 'feather off' indicator to show the route set. Only single feathers are currently supported.

If *Signal 1 Routed* is configured, then the flags for Signal 1 and Signal 2 control the signal output. If either Signal 1 D-Yellow-D/Alt or Signal 2 D-Yellow-D/Alt flag is ON, the Signal 2/Alt group will be used to control the aspect instead of the Signal 1 group.

If *Signal 3 Routed* is configured, then the flags for Signal 3 and Signal 4 control the signal output. If either Signal 3 D-Yellow-D/Alt or Signal 4 D-Yellow-D/Alt flag is ON, the Signal 4/Alt group will be used to control the aspect instead of the Signal 3 group.

Note that the D-Yellow-D/Alt flag is not available to control the Double-Yellow signal aspect in 'routed' mode.

2.12.3 Event Selection

Each decoded CBUS event may turn one or more of 64 internal CANSIG “flags” ON or OFF, using a similar dialogue to that of the CANLED64. One tab on the form is used for each signal.

Routed Signals

For a routed signal, two sets of 15 flags is used to control the setting depending on the two route setting flags:

Routed Signal 1

if (Signal1:D-Yellow D/Alt or Signal2:D-Yellow D/Alt) are 'On' then use Signal 2 flags, else use Signal 1 flags

Routed Signal 3

if (Signal3:D-Yellow D/Alt or Signal4:D-Yellow D/Alt) are 'On' then use Signal 4 flags, else use Signal 3 flags

Notes

This allows different inputs to be used to control the signal based on a point or other setting.

Whilst this seems complex, it does allow for a reasonably correct signal display even on a large and complicated layout.

Note that only three D-Yellow flags are available for each signal/route in this mode as the fourth is used for route selection

2.12.4 Route Indicators

In routed mode, the Signal 2 and/or Signal 4 outputs are used to display feathers or other route indications for Signal 1 and Signal 3 as follows:

Aspect	Signal2	Signal 4
Red	Signal 1 Routed	Signal 3 Routed
Yellow 1	Signal 1 Routed	Signal 3 Routed
Green	Signal 1 Unrouted	Signal 3 Unrouted
Yellow 2	Signal 1 Unrouted	Signal 3 Unrouted

Note that the Routed/Unrouted indications will not be on with a Red signal unless *Display route with Red aspect* is configured

2.13 CBUS RFID Concentrators

There are two new designs of the RFID Concentrator Modules for connecting RFID Tag Readers to CBUS:

The CANRFID8 which uses a CANMIO board and allows for connection of up to eight RFID reader units;

The CANmchRFID which uses bespoke doubled sided PCBs and comes in two variants supporting either two or up to eight RFID reader units.

The CANmchRFID firmware is derived from the CANRFID8 firmware and utilises the same User interface.

The same CANmchRFID firmware runs on either of the two variants:

The CAN2chRFID (a 5cm x 6cm pcb) is capable of connecting to 2 RFID Readers;

The CAN8chRFID is a larger (5cm x 10cm pcb) and is capable of connecting up to 8 RFID readers.

These RFID Concentrator Modules do not generate events. When a tag is read, they generate an 8 byte CBUS message consisting of the DDES OpCode , a 2 byte "Device Number" and 5 bytes which is the RFID tag number.
The 'Device Number' or DN is used in the CBUS 'short' event scheme, and is effectively a short event. Each reader input is given its own unique DN in the range of 1 to 65535 which corresponds to that readers Identity.

All Modules initially operate as SLIM mode producers. There are 4 links on the modules that allow 16 unique module identities to be set, giving a unique pre-set range of Reader Identities.
The two CANmchRFID Modules set the identity using links on the PCB, labelled LK2 to LK5.
The CANRFID8 Module uses the 10-way header, J3, on the PCB. The pins used to select the modules identity uses ports RA0, RA1, RA3 and RA5.

The correspondence between links, CANID and Reader ID/Device Number is shown in the table below:

To avoid likely conflict with other SLiM boards, the CAN_ID starts at 65. This takes it out of the range of all the other SLiM producers: CANACE3 and CANACE8C boards.

The CAN2chRFID module uses inputs RFID A and RFID B only.

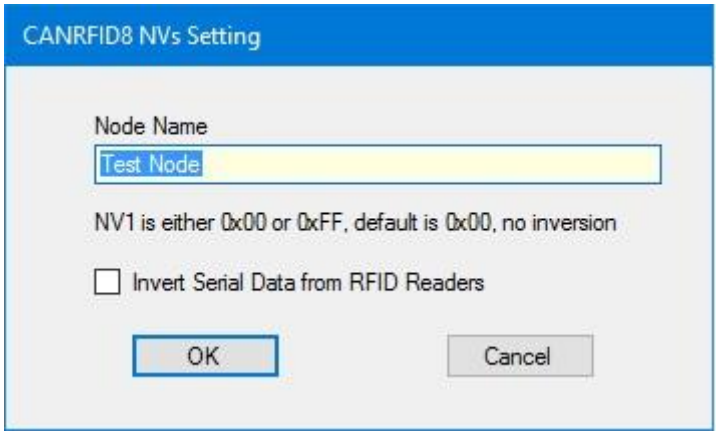


Figure 37 - CANRFID8 and CANmchRFID NVs dialogue

The NVs for the CBUS RFID readers are either set to 0x00 or 0xFF, the value can be changed by checking or unchecking the Invert Serial Data from RFID Readers check box.

2.13.1 Events

RFID readers only support short events; each variant has a default set of short events associated with each channel. However, it is possible to associate a different short event with a reader channel using the FCU. The modules must be in FLiM mode to use this option. See the dialogue below for setting the association between a Channel and a device event

When the Module is in FLiM mode, the Channel/Short Event association can be read from a module by selecting Nodes/Read Events with the FCU.

The RFID modules do not generate events, they generate a DDES message which contains the device number in the first two bytes and the 5-byte RFID tag in the rest of the message.

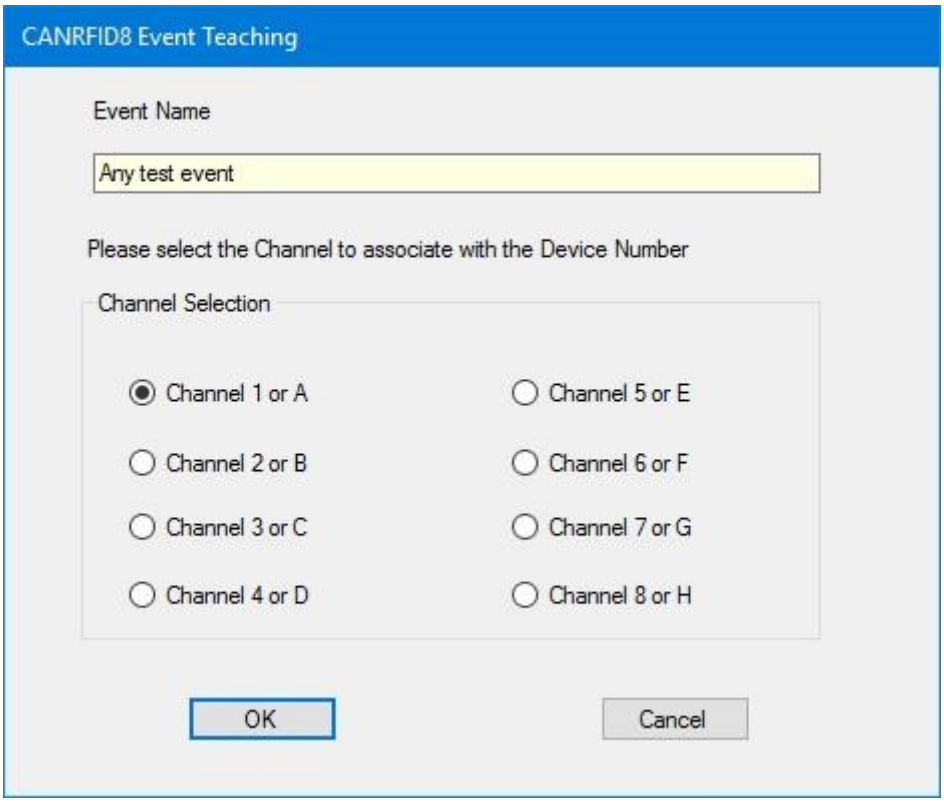


Figure 38 - Associating an Event with a RFID Reader Channel.

The only NV for the CBUS RFID Concentrator inverts serial data from the RFID readers. It is set to 0x00 or 0xFF (default 0x00 - data not inverted). The value can be changed by checking or unchecking the Invert Serial Data from RFID Readers check box.

These CBUS RFID readers only support short events; each Module has a default set of short events (device numbers) associated with each RFID input channel. However, it is possible to associate a different short event with a reader channel by using the FCU. The modules must be in FLiM mode to use this option.

When the Module is in FLiM mode, the Channel/Short Event association can be read from a module by selecting Nodes/Read Events with the FCU.

To create a new Reader Identity, you create a new short event as described below:

Highlight the software node and select “Events” and “learn”;
In the box give an event name for example “RFID reader 101”;
In the “event number” put the new number you want for that reader identity (e.g. 450). Then press OK.

Then highlight the RFID8 or mchRFID reader node and select “Events” and “teach”;
Select the Software Node in the Source Nodes and select the “RFID reader 101” or whatever you called it and press OK.
You then get the CANRFID Event teaching dialog as show above.
Select the channel you want for the new reader identity.

SLiM/FLiM Mode operation

Mode selection:

4 links (LK2 to LK5, or RA0, RA1, RA3 & RA5) allow 16 alternative ranges of device numbers to be used.

The correspondence between links, CANID and Device Number is shown in the table below:

To avoid likely conflict with other SLiM boards, the CAN_ID starts at 65. This takes it out of the range of all the other SLiM producers: CANACE3 and CANACE8C boards.

The 2ch module uses inputs RFID A and RFID B only.

CBUS RFID Module (SLiM Mode)												
Set links for module address				CAN ID	Tag reader ID / Device No.							
RA0 or LK2	RA1 or LK3	RA3 or LK4	RA5 or LK5		RFID 1 or A	RFID 2 or B	RFID 3 or C	RFID 4 or D	RFID 5 or E	RFID 6 or F	RFID 7 or G	RFID 8 or H
open	open	open	open	65	20001	20002	20003	20004	20005	20006	20007	20008
closed	open	open	open	66	20009	20010	20011	20012	20013	20014	20015	20016
open	closed	open	open	67	20017	20018	20019	20020	20021	20022	20023	20024
closed	closed	open	open	68	20025	20026	20027	20028	20029	20030	20031	20032
open	open	closed	open	69	20033	20034	20035	20036	20037	20038	20039	20040
closed	open	closed	open	70	20041	20042	20043	20044	20045	20046	20047	20048
open	closed	closed	open	71	20049	20050	20051	20052	20053	20054	20055	20056
closed	closed	closed	closed	72	20057	20058	20059	20060	20061	20062	20063	20064
open	open	open	closed	73	20065	20066	20067	20068	20069	20070	20071	20072
closed	open	open	closed	74	20073	20074	20075	20076	20077	20078	20079	20080
open	closed	open	closed	75	20081	20082	20083	20084	20085	20086	20087	20088
closed	closed	open	closed	76	20089	20090	20091	20092	20093	20094	20095	20096
open	open	closed	closed	77	20097	20098	20099	20100	20101	20102	20103	20104
closed	open	closed	closed	78	20105	20106	20107	20108	20109	20110	20111	20112
open	closed	closed	closed	79	20113	20114	20115	20116	20117	20118	20119	20120
closed	closed	closed	closed	80	20121	20122	20123	20124	20125	20126	20127	20128

2.14 CANMIO-UNIVERSAL, CANXIO and CANVINP Modules.

This is a group of modules based upon Universal Firmware. They enable the user to choose the channel types subject to limits imposed by how the module is physically built. They provide 8,16 or 24 channels dependent upon the module involved.

2.14.1 Initial setup.

It is essential that the user reads using the FCU the following from the module before proceeding further.
Node Values.
Module Properties.
Events.
these can all be accessed by use of the top menu in the FCU or by right clicking on the module entry in the upper left window.

2.14.2 Channel setup and usage.

This is such an involved module that it has its own guide. It is available in the CBUS Central knowledgebase pages or via this link

2.15 CANPiWi Module

The CANPiWi module uses a Raspberry Pi zero or a Raspberry Pi v3 running the relevant Pi Software. An adaptor board is used to connect the CANPiWi to CBUS.

The module starts on initial power-on in SLiM mode with a default node number of 4321. The PB on the adaptor board can be pressed to put the module into FLiM mode, the FCU will allocate a new node number.

The only settings that can be edited by the FCU are the Node Variables.

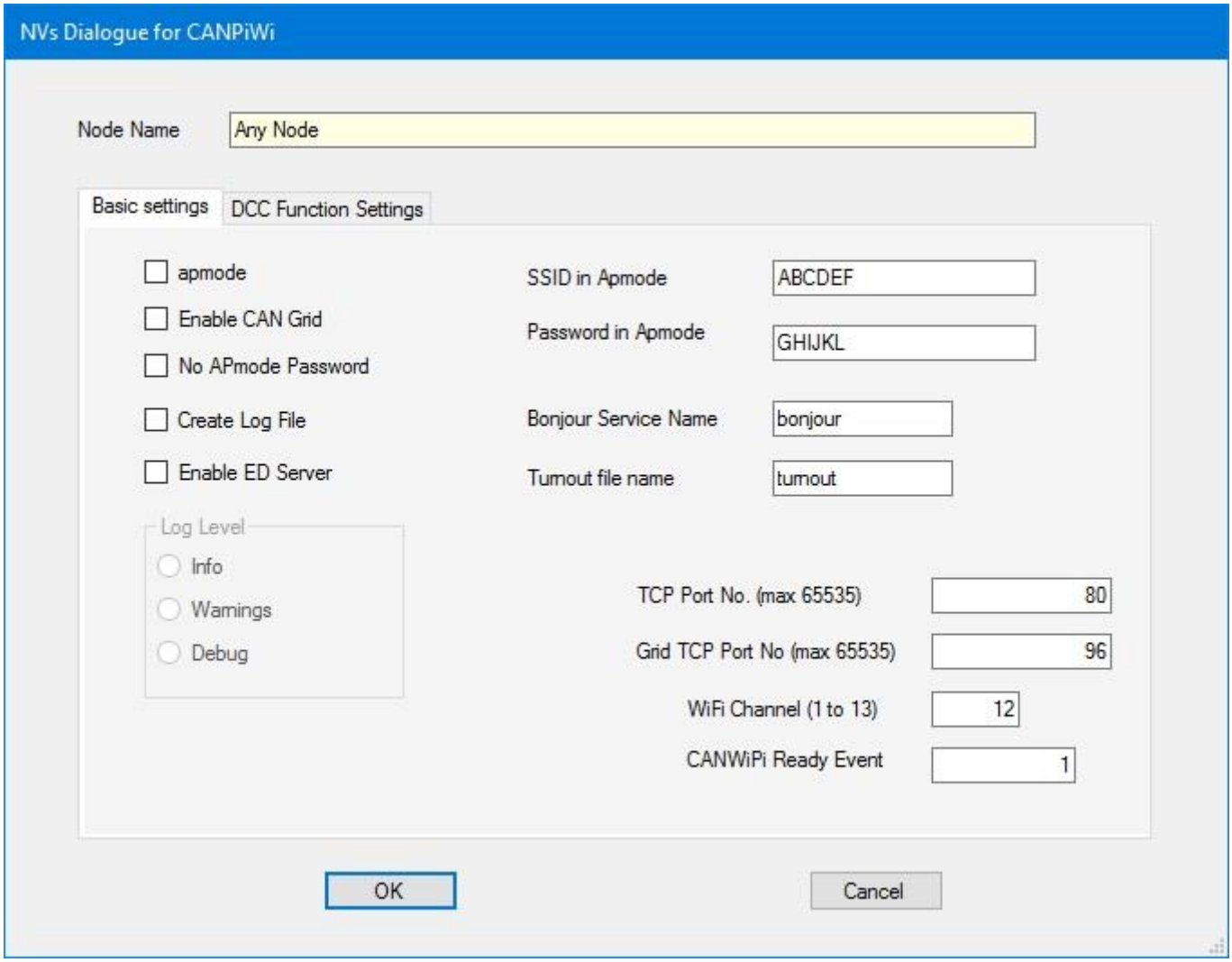


Figure 39 - Basic NV settings .

Basic Settings Tab.

Bonjour service name - The service name announced to EDs. This is the name that will show in the first screen of ED when connected to the same network as the CANPiWi.

TCP port - **ED Throttle Service port**

The TCP port that the ED service accepts connection. This value will be displayed in the ED screen. Default value is 5555.

Grid TCP Port No.

The TCP port that the GridConnect service accepts connection. Default value is 4444.

Can grid enabled

Enable or disable the GridConnect service to run.

Enable ED Server - Engine Driver server enabled

Enable or disable the ED server service to run. The default value is true.

Turnouts - turnout file

A file name stored inside the CANPiWi with the turnout definition. See the section Configuring the turnout file. The default file name is “turnout.txt”.

Log file - logfile name

The log file name is stored inside the CANPiWi. This file is mostly used for debug purposes. It is reset every time the module starts. In case the module stays on for several times without reset, the file will be split into 10 files of 5Mbytes size using a file rotation system.

Log level

Create Log File must be selected for the log level selection to be enabled.

Indicates the granularity of the information present in the log file. The possible levels are:

- INFO
- WARN
- DEBUG

DEBUG level is the most verbose mode of them.

Create Log File

Indicates if the log file should be created.

DCC Function Settings Tab

Momentary Functions

Specifies which Fn key has the momentary behavior by default. The standard value is 2.

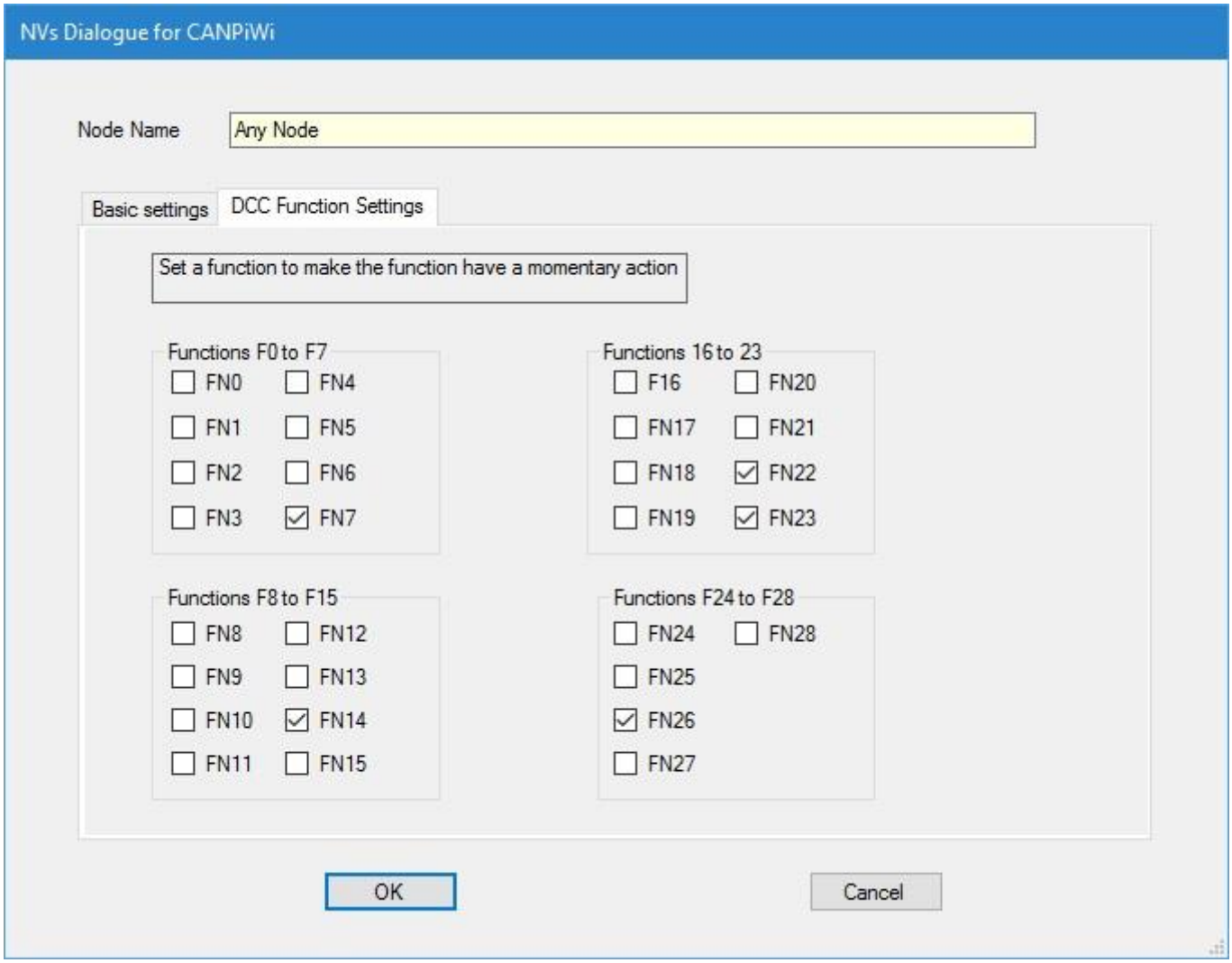


Figure 40 - DCC Function settings

Select which functions are to have a momentary action.

2.16 CANSCAN Module.

This is a new module and is not available as a kit yet. It is intended as a replacement for the CANACE3. It offers an increase functionality in that each switch or push button can be individually configured. Before use any switch must be configured to define its operation mode. The module uses a 18F25K80 PIC and is designed for 12v DC power input.

When a switch is first operated, an event will appear in the Event Grid provided the CANSCAN node is selected in the Node Grid. This event must be configured to define the switch action. As this is a local event, the External Event Options are disabled.

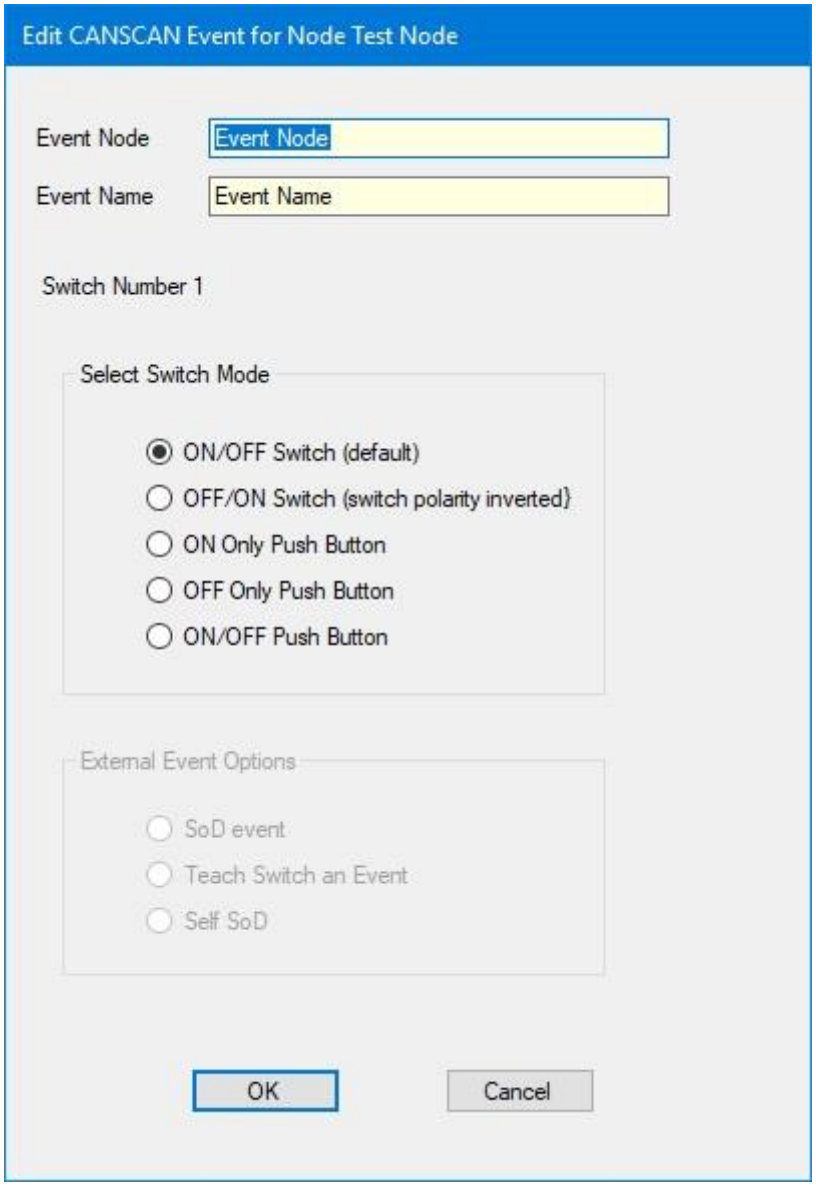
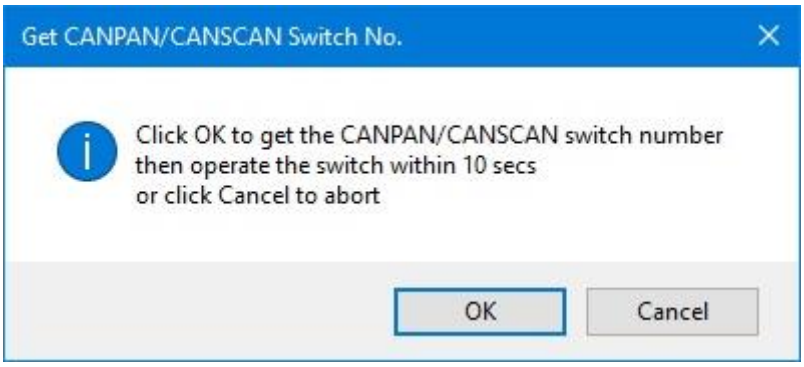


Figure 41 - Event teaching dialogue for local switch events

All the following options will require the target switch to be selected. A message Box is displayed as shown below.



The Teach Switch an Event option must have an associated switch mode selected. The SoD event does not have a Switch Mode and the Switch Mode options will be disabled for this option. The SoD option causes the CANSCAN to transmit the current state of all the switches.

This option acts as the SoD option with the addition that the Self Sod event itself is also transmitted, so other nodes can also respond to it. Note that the Self SoD option is only enabled for a Short Event.