CC DRIVERS

Source Logic Driver

for RTI control processors

Reference Manual for Programmers

January 2016

The source and zone logic virtual driver offers a framework for programming home control systems. The driver keeps track of the source that is current in each zone. The driver signals when an 'on' or 'off' event occurs for a source or zone, and when a source is switched for a zone. RTI programmers can use the event signals to trigger macro routines that send appropriate commands to their devices. Power-up and down delays are incorporated in to the driver logic. Each remote controller has its own view of the system as configured by the installer.

Source and Zone Logic Driver

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Copyright and Disclaimer Notice

ANY USE OF THE SOURCE LOGIC DRIVER CONSTITUTES ACCEPTANCE OF THE TERMS OF THE COPYRIGHT NOTICE.

Licence

A licence is required for each instance of the Source Logic Driver, i.e. a licence for every processor on which it is deployed.

The driver may be run for trial purposes without a license. In this mode the driver will time out after sixty minutes.

Licenses may be obtained from CC Drivers, ccdrivers.co.uk.

Users

The Source Logic Driver is intended to be used by home automation professionals and enthusiasts with appropriate knowledge and training in the operation of RTI equipment and processors.

Contents

Summary of Features

A (home) control system consists of sources and zones. Sources are devices such as Audio Systems and Satellite/Cable TV receivers. Zones are the different areas of the premises with their own output devices such as speakers and display screens.

The Source Logic Driver is a virtual driver designed for home control installers and programmers[1]. It facilitates the selection and switching of sources and zones, and manages the logic for when source and zone devices need to be switched on or off. Below is a summary of the driver's main features, followed by an explanation of all the commands, variables and events provided by the interface.

- **Event driven design:** An (RTI) Event signal is sent whenever a user's input requires a command to be sent to a source, zone, or switching unit. The events signal when a source or zone must be switched on or off, and when a source-zone switch must take place. Using event-based techniques simplifies the programming effort by significantly reducing the need to set and test status flags. Programmers using this driver are expected to know how to use Integration Designer to link an appropriate macro to each event of interest.

- **Audio and/or Display sources:** Each source is designated as one of 'Audio', 'Display', or 'Audio and Display'. Corresponding Audio on/off and Display on/off events are signalled depending on the source type.

- **Multiple remotes:** Each remote controller or touch panel has a current source-zone status independent of other controllers. *Remote-specific* variables (as opposed to 'global' variables) are clearly marked in the driver interface. Both remote-specific and global variables may be used on button macros on the remote controllers and touch panels. Only global variables may be used in 'system' macros.

- **Current source and zone switch:** Many of the driver commands lead to a change in the source and zone that the issuing remote wishes to control. The driver issues "Switch Current" events to signal change requests. The programmer must link a macro to the switch events to redirect the new current source to the new current zone.

- **History of active Sources and Zones:** The Source Logic Driver keeps a history of active zones visited on each remote. When the remote is used to switch to a different zone then it is added to the history. If the current zone is switched off then the most recent zone that is still active will become the current zone together with the source that is currently routed to that zone. Switch events are sent to signal this change.

- **Zone restrictions on each remote:** The zones under control of each remote controller are specified in the driver configuration dialogue. Any command that is sent to a zone that is not in the remote's list is ignored.

- **Zone navigation:** There are commands to step forwards and backwards through the zones of a remote, or jump to a particular zone.

- **Configurable power on/off delays:** Programmers often need to put delay commands into their macros to wait for devices to power up (or down) before RS232/IR commands can be sent. This

[1] 'Installer' and 'programmer' is often the same person. In this document the terms are sometimes used arbitrarily and interchangeably. The terms try to capture 'roles', rather than people.

is no longer required. The installer can specify the on/off durations in the driver configuration dialogue in Integration Designer and the Source Logic Driver does the rest.

- **Source off suspension time:** Installers can suspend source off requests for a specified time. This helps improve HDMI switching so that a source in a zone is not switched off before the new one is ready.

- **Signals when a source or zone is ready:** 'Switch Current' source-zone events are sent when power on/off delays have timed out.

- **Switch events are queued:** In a home with multiple remotes it is possible that two or more switch events are requested at the same time. If this happens then the event signals are queued and sent with an interval between them to allow the triggered macros to complete. Programmers specify the minimum interval they require in the driver configuration dialogue.

- **Commands disabled while sources and zones are powering on/off:** Commands to switch a source or a zone on or off are ignored while its power on/off delay is active. The global 'Busy' status variables may be used to indicate when a source or zone is in powering on/off mode.

- **Please Wait status and progress:** Wait status variables can be used with a progress bar, for example, to give feedback on the percentage completion of a delay.

- **Supports activity-based user interfaces:** Some installers program their remotes so that users select the source and zone before sending the switch command. This driver has 'Selection' commands to record a user's source and zone choices, and commands that switch on/off the stored selection.

- **Zone and Source labels:** User-friendly names can be assigned to each source and zone. The names of the current source and zone are available in (remote-specific) variables.

- **Dynamic Naming:** The zone and source labels are used to give meaningful variables names in Integration Designer.
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- **Dynamic Configuration:** only the variables for the specified number of sources, zones and remote controllers appear in the driver configuration dialogue and ID variables list.

Logic Rules

The logic rules for this driver are as follows:

- At most one source can be playing in a given zone.
- The same source can be playing in many zones.

- **Source On Event** is signalled when a source is requested by any zone and that source is not already on. If the source is already on in another zone then no event is signalled.
- **Source Off Event** is signalled when a zone switches to another source or switches this source off and no other zone is playing this source.

- **Zone On Event Audio/Display** is signalled when a source on or switch request is made in a zone and the audio/display is not already on in that zone.
- **Zone Off Event Audio/Display** is signalled when the audio or source is no longer required in the zone as a result of a source switch or source off command.

- **Source X Switch Event** and **Zone Y Switch Event**. This pair of events is thrown whenever a source change occurs on a zone. X is the new source routed to zone Y.

- **Views**. Each remote controller has its own Current Source and Current Zone.

- **Blocking.** Switching commands are ignored if the corresponding zone or sources are currently powering up or down.

The sample program provided with this driver demonstrates how sources and zone are switched on and off. There are system macros as placeholders for each source and zone on and off command, which are triggered by the corresponding events. (See the System Macros and Events tabs in the Control System device).

Configuration

The following information must be entered in the configuration settings in the Driver tab of the processor in Integration Designer.

Setting	Parameter	Comment
License		
Have License	Check box	Check the box if you have a licence. A field will appear for the licence number. Leave this box unchecked to use the driver for 60 minutes.
License Number	String	Enter licence number in this field, e.g. AAAA-BBBB-CCCC-DDDD
Sources and Zones		
Number of Sources	Choose from 1..12	The number of sources, zones and remotes in your system. These values can be updated as sources, zones or remotes are added or removed.
Number of Zones	Choose from 1..12	
Number of Remotes	Choose from 1..12	
Source 0		
No Source Label	String	The string to display when no source is current, for example E.g. No Source
Source N		
Label	String	The string to display for source N. E.g. CCTV
Type	Choose from: - Audio - Display - Audio and Display	A source can be Audio only, e.g. DAB, Display only, e.g. CCTV, or Audio and Display, e.g. (DVD)
On delay	Seconds	Time required for this source to switch on.
Off delay	Seconds	Time required for this source to switch off.
Zone 0		
No Zone Label	String	The string to display when no zone is current. E.g. No Zone
Zone N		
Label	String	The string to display for zone N. E.g. Kitchen
On delay: Audio	Seconds	Time required for audio to switch on in this zone.
Off delay: Audio	Seconds	Time required for audio to switch off in this zone.
On delay: Display	Seconds	Time required for display to switch on in this zone.
Off delay: Display	Seconds	Time required for display to switch off in this zone.

Remote Control N		
ID	Number	The ID number of a remote controller, as assigned by Integration Designer. (See 'Remote Id' in Variables section for information on how to discover its value.)
Zones	List of numbers	A space separated list of zones controlled by Remote controller X. E.g. 1 3 5 7
Switch Event Interval		
Minimum Interval (milliseconds)	Milliseconds	If "Switch Events" occur close together then they are queued, and released at intervals to allow completion of macros before global variables are overwritten with the next set of data. This parameter sets the minimum time between switch event signals. This should be (at least) the longest time required for your event macros to complete.
Wait threshold		
Please Wait Threshold	Seconds	The Please Wait variable will only be set to true when the delay for powering sources and zones on/off is at least the number of seconds specified in this setting. For example, setting this to 3 seconds means 'please wait' functionality is not triggered for delays of less than 3 seconds.
Suspend source off		
Time to suspend source off request	Seconds	This is a global setting for all sources. When a zone switches from one source to another there can be HDMI switching issues if the original source is switched off before the new one is ready. This setting suspends the source off request by the given duration. Suggestion: make this at least the duration for the source with the longest switch on time.

Commands

When placing commands on a remote control, programmers should only use zone parameters that are controlled by that remote. Commands for zones that are not controlled by that remote are ignored.

Command	Parameter	Comment
On-Off Commands		
Switch Off Source-Zone	Source (S) Zone (Z)	Switches off source S on zone Z. Current source and zone status variables are updated on affected remotes: - The most recent active zone becomes current on the remote issuing the command; - No Source is Current on other remotes that have zone Z as current. - Source S Off is scheduled if S is not on in another zone. Events: - Zone Z Off Audio/Display; - Source S Off (if still unused at end of scheduled time) - No Source Switch; - Zone Z Switch. If (S, Z) is already off then nothing happens.
Switch On Source-Zone	Source (S) Zone (Z)	Switches on source S on zone Z. Current source and zone status variables are updated on affected remotes: - Source S is Current and Zone Z is Current on the issuing remote; - Source S is Current on other remotes that have zone Z as current - If the previous source (P) on Z is not on in another zone then it is scheduled to switch off. Events: - Zone Z On Audio/Display (if it was off) - Source S On (if it was off) - Source P Off (if scheduled and still unused at the end of that time.) - Source S Switch; - Zone Z Switch. If (S, Z) is already on then nothing happens.
Toggle On-Off Source-Zone	Source S Zone Z	Switch Off if (S, Z) is on. Switch On if (S, Z) is off. (details as above)

Selection Commands		These are remote-specific commands. Each remote controller stores a current source and zone selection, which is used in Off/On/Set Selected commands.
Set Selected Source	Source S	S becomes the selected source on the issuing remote. The Current Selected Source variables are updated (Number, Label, and on/off status). Event: - Source S Selected Event is signalled.
Set Selected Zone	Zone Z	Z becomes the selected zone on the issuing remote. The Current Selected Zone variables are updated (Number, Label, and on/off status). Event: - Zone Z Selected Event is signalled.
Clear Selected Source	None	"No Source" becomes the selected source on the issuing remote. The Current Selected Source variables are updated. Event: - No Source Selected Event is signalled.
Clear Selected Zone	None	"No Zone" becomes the selected zone on the issuing remote. The Current Selected Zone variables are updated Event: - No Zone Selected Event is signalled.
Switch Off Selected	None	Equivalent to Switch Off (S, Z), using the currently selected source (S) and zone (Z) on the issuing remote.
Switch On Selected	None	Equivalent to Switch On (S, Z), using the currently selected source (S) and zone (Z) on the issuing remote.
Toggle On-Off Selected	None	Equivalent to Toggle On-Off (S, Z), using the currently selected source (S) and zone (Z) on the issuing remote.
Set Current to Selected Zone	None	Equivalent to Set Current Zone (see below), using the zone (Z) on the issuing remote.

Zone Navigation		Each remote has at most one "Source S is Current" variable and at most one "Zone Z is Current" variable set to true. These commands change the current source and zone for a given remote control device.
Set Current Zone	Zone Z	Makes Z the current zone, and updates the Source Current and Zone Current variables on the remote issuing the command.
Set Next Zone Current	None	Sets the current zone to the next one based on the list of ascending zone numbers controlled by the remote issuing the command. Wraps to the beginning of the list when the end is reached. Updates the Source Current and Zone Current variables for the remote.
Set Previous Zone Current	None	Sets the current zone to the previous one based on the list of ascending zone numbers controlled by the remote issuing the command. Wraps to the end of the list when the end is reached. Updates the Source Current and Zone Current variables for the remote.
Shut Down		
Shut Down Source	Source S	Switches off zones that are playing the source S. Only zones controlled by the remote issuing the command are considered. This command is equivalent to successive Switch Off (S, Z) commands for those source-zone pairs.
Shut Down Zone	Zone Z	This command is equivalent to Switch Off (S, Z) where source S is playing in zone Z.
Shut Down All Zones	None	This command is equivalent to Shut Down Zone (Z) for all zones controlled by the remote issuing the command. At the end of this operation "No Source is Current" and "No Zone is Current" on remote issuing the command.

Variables

Each remote controller has its own view of the system. Some variables are 'remote-specific' meaning that they may have different values on different remote controllers. Global variables have the same value on all remotes. Remote specific and global variables may be used in macros on a remote controller. Only global variables may be used in system macros. Remote-specific variables are clearly indicated in the table below.

Variable	Data Type, Values	Comment
Remote Control – Remote specific		
Remote Control ID *(Remote Specific)*	Integer, value set by Integration Designer	Enables the installer to check the id number of a (two-way) remote control device. Use this number in the ID field when completing the driver's configuration data for a remote control. (See RemoteIdTester driver - available from ccdrivers.co.uk - to discover the remote id of a one-way device.)
Wait Status – Remote specific		The 'Wait' variables are only set on the remote device that issued the command that initiated the wait.
Waiting	boolean, false/true	True while waiting for sources or zones to complete their 'on' or 'off' function. Remains true while any source or zone is 'Busy'.
Please Wait	boolean, false/true	True when in a Waiting state (see above) provided the expected wait time is at least the threshold specified in the driver configuration. For example, this variable could be used to make a 'Please Wait' progress bar or overlay visible for delays that exceed the threshold.
Wait Progress %	integer, 0% - 100%	The percentage time elapsed whilst waiting for critical functions to complete. The percentage can be displayed or used as the data value of a progress bar, for example. The percentage is dynamic and may increase if other sources or zones are switched on/off when in progress.

Busy – Global (_G)		The 'Busy' variables indicate when a source or zone is powering up or down. The on/off delay times are provided in the driver configuration data. Switching (i.e. toggle source-zone on/off) commands are ignored on a source or zone that is 'busy'.
Something is Busy_G	boolean, false/true	True while any source or zone is powering up or down.
Nothing is Busy_G	boolean, false/true	True while no source or zone is powering up or down.
Some Source is Busy_G	boolean, false/true	True while some source is powering up or down.
No Source is Busy_G	boolean, false/true	True while no source is powering up or down.
Source X is Busy_G *(for X=1..max sources)*	boolean, false/true	True when source X is powering up or down.
Some Zone is Busy_G	boolean, false/true	True while some zone is powering up or down.
No Zone is Busy_G	boolean, false/true	True while no zone is powering up or down.
Zone X is Busy_G *(for X=1..max zones)*	boolean, false/true	True when zone X is powering up or down.
Current Source - Global		These global variables give data for the most recent source/zone switch event taken from all the remotes. Global variables may be tested in system macros. Once set, the variables are guaranteed not to be overwritten for at least the "Switch Event Interval" specified in the driver configuration. This gives time for switching macros to complete correctly.
Current Source Number_G	integer, 0..max sources	The index of the most recent source switch.
Source X is Current_G *(for X=1..max sources)*	boolean, false/true	True when X is the most recent source to become current as a result of a Switch Event (triggered by any remote), otherwise false. Current Source Number_G is X.

No Source is Current	boolean, false/true	True when no source becomes current as a result of the most recent Switch Event (triggered by any remote), otherwise false. Current Source Number_G is 0.
Current Zone - Global		See comment for Current Source – Global above.
Current Zone Number_G	integer, 0..max zones	The index of the most recent zone switch.
Zone X is Current_G *(for X=1..max zones)*	boolean, false/true	True when X is the most recent zone to become current as a result of a Switch Event (triggered by any remote), otherwise false. Current Zone Number_G is X.
No Zone is Current_G	boolean, false/true	True when no zone becomes current as a result of the most recent Switch Event (triggered by any remote), otherwise false. Current Zone Number_G is 0.
Current Source –Remote Specific		
Current Source Number	integer, 0..max sources	The index of the most recent source switch on a remote.
Source X is Current *(for X=1..max sources)*	boolean, false/true	True when X is the most recent source to become current on this remote, otherwise false. Current Source Number is X.
No Source is Current	boolean, false/true	True when no source is current on the remote, otherwise false. Current Source Number is 0.
Current Zone –Remote Specific		
Current Zone Number	integer, 0..max zones	The index of the most recent zone switch on a remote.
Zone X is Current *(for X=1..max zones)*	boolean, false/true	True when X is the most recent zone to become current on this remote, otherwise false. Current Zone Number is X.
No Zone is Current	boolean, false/true	True when no source is current on the remote, otherwise false. Current Zone Number is 0.

Source X Zone Y On/Off		
Source X Zone Y On *(for X=1..max sources, and Y=1..max zones)*	boolean, false/true	On-off status for each source and zone pair. On=true, Off=false.
Source On/Off		
Source X On *(for X=1..max sources)*	boolean, false/true	A virtual on status for each source. On=true, Off=false. The value is set to true when a Source On Event is signalled. The value is set to false when a Source Off Event is signalled.
Zone On/Off		
Zone X On *(for X=1..max zones)*	boolean, false/true	A virtual on status for each zone. On=true, Off=false. The value is set to true when either of Zone On Event Audio/Display is signalled. The value is set to false when a Zone Off Event (Audio/Display) is signalled and no source is on in zone X.
Source Selection – Remote specific		
Current Selected Source Number	integer, 0..max sources	The index of the current source selection on the remote. Zero if there is no selection. The number corresponds to the configuration data.
Current Selected Source Label	string	If source X is currently selected then this label is set to Source X Label.
No Source Selected	boolean, false/true	True = no source selected. Current Selected Source Number =0. False = some source selected
Source X Selected *(for X=1..max sources)*	boolean, false/true	True = source X is the current selection on the remote. False = source X is not the current selection on the remote.

Zone Selection – Remote specific		
Current Selected Zone Number	integer, 0..max zones	The index of the current zone selection on the remote. Zero if there is no selection. The number corresponds to the zone in the configuration data.
Current Selected Zone Label	String	If zone X is currently selected then this label is set to Zone X Label.
No Zone Selected	boolean, false/true	True = no source selected. Current Selected Zone Number =0. False = some zone is selected
Zone X Selected *(for X=1..max zones)*	boolean, false/true	True = zone X is the current selection on the remote. False = zone X is not the current selection on the remote.
Source Labels		The Source Labels are strings that can be displayed on the remote control devices. The labels are set in the driver configuration.
Current Source Label ***(Remote Specific)***	string	The name of the source that is currently under control on the given remote. It is a Source Label X or No Source Label.
No Source Label	string	The name given to denote "no source".
Source Label X *(for X=1..max sources)*	string	The name for each Source X, e.g. Sky+, CCTV, etc.
Zone Labels		The Source Labels are strings that can be displayed on the remote control devices. The labels are set in the driver configuration.
Current Zone Label ***(Remote Specific)***	string	The name of the zone that is currently under control on the given remote. It is a Zone Label X or No Zone Label.
No Zone Label	string	The name given to denote "no zone".
Zone Label X *(for X=1..max zones)*	string	The name for each Zone X, e.g. Lounge, Kitchen, etc.

Events

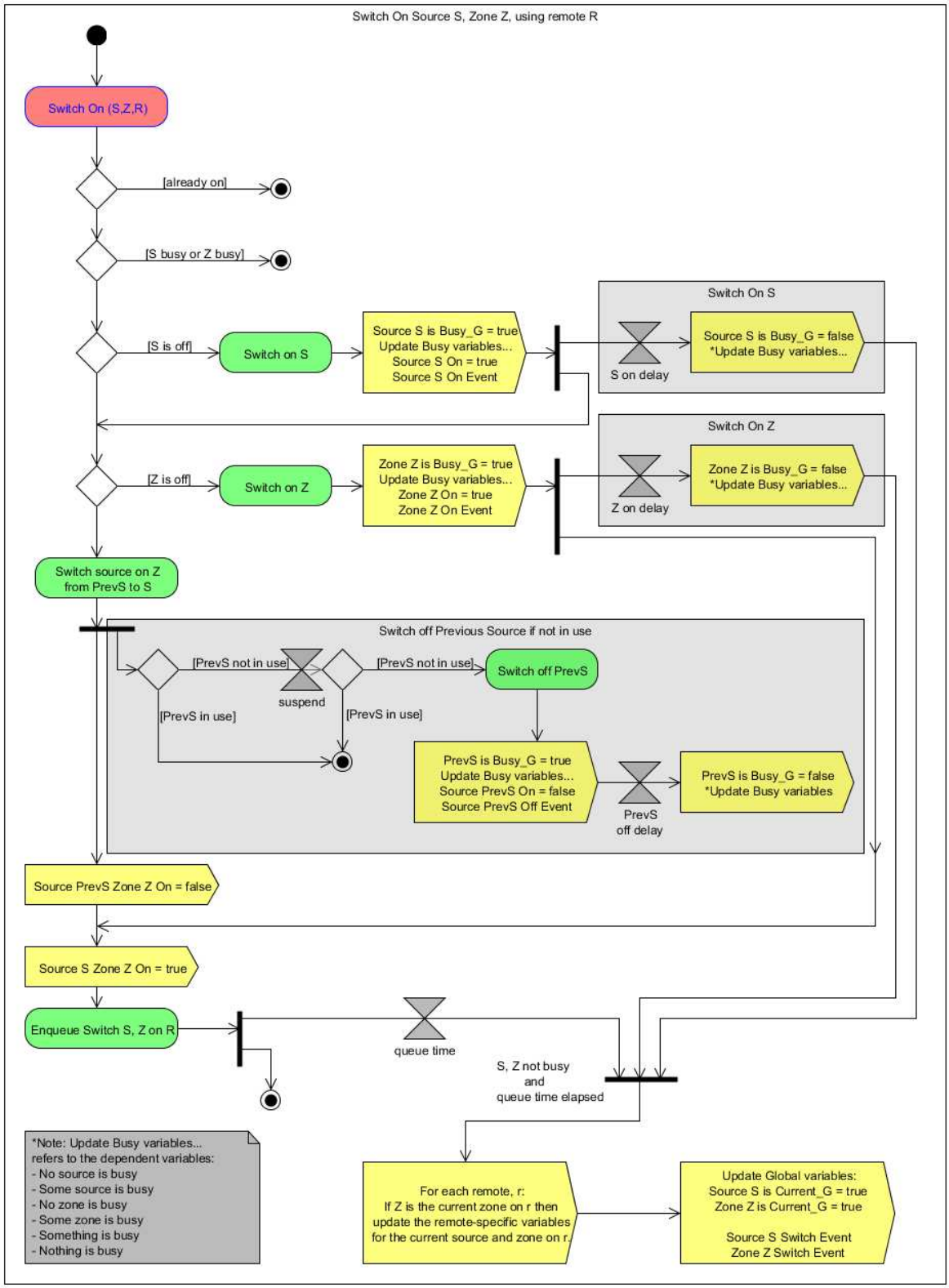
The events generated by the Source Logic Driver provide the hooks for system macros. The system programmer must attach system macros to the various events. These macros must contain the device specific commands to switch on or switch off source and zone equipment, and to route matrix switches.

<table>
<tr><th>Event</th><th>Comment</th></tr>
<tr><td>On and Off Events</td><td></td></tr>
<tr><td>Source X On Event
(for X=1..max sources)</td><td>Signalled when source X is requested by a zone and that source is not already on.</td></tr>
<tr><td>Source X Off Event
(for X=1..max sources)</td><td>Signalled when a zone playing source X is switched off or switched to a different source, and no other zone is playing source X.</td></tr>
<tr><td>Zone X On Event Audio
(for X=1..max zones)</td><td>Signalled when zone X switches to an 'Audio' source or an 'Audio and Display' source from a Display source or off state.</td></tr>
<tr><td>Zone X On Event Display
(for X=1..max zones)</td><td>Signalled when zone X switches to a 'Display' source or an 'Audio and Display' source from an Audio source or off state.</td></tr>
<tr><td>Zone X Off Event Audio
(for X=1..max zones)</td><td>Signalled when zone X switches to a 'Display' source or to an off state from an 'Audio' or 'Audio and Display' source.</td></tr>
<tr><td>Zone X Off Event Display
(for X=1..max zones)</td><td>Signalled when zone X switches to an 'Audio' source or an off state from a 'Display' or 'Audio and Display' source.</td></tr>
<tr><td>Switch Current Source/Zone Events</td><td>These events are generated whenever a new source-zone pairing occurs. In system macros the source and zone can be determined by immediately inspecting the 'Source X is Current_G' and' Zone Y is Current_G' variables. These global variables hold their value for at least 'Switch Event Interval' set in the driver configuration. They are overwritten when the next Switch Event occurs.</td></tr>
<tr><td>No Source Switch Event</td><td rowspan="4">Two events are generated immediately after a source-zone pair (X, Y) becomes current on any remote, where X>0, Y>0.
- Source X Switch Event
- Zone Y Switch Event.
Both a source switch event and a zone switch event are signalled when there is a change, even if only one of the source or zone has actually changed.

No Source Switch Event is generated when a command results in the current zone playing no source.
No Zone Switch Event is generated when all the zones controlled by the remote (that generated the switch command) become off.</td></tr>
<tr><td>Source X Switch Event
(for X=1..max sources)</td></tr>
<tr><td>No Zone Switch Event</td></tr>
<tr><td>Switch Zone Y Event
(for Y=1..max zones)</td></tr>
</table>

Activity Diagrams

Switch On (Source, Zone)



Switch Off (Source, Zone)