BNCS Device Drivers

Atos IT Solutions and Services

Combiner

Combiner32.exe

Revised by Steve Lowe

(Based on the original Combiner applications
written by Simon Dowson)

BNCS

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BNCS

1 Overview

1.1 Description

Combiner32 is based on the V3 Combiner with some additional features including External Client connection. The background GRD services are now provided by a separate host GRD with the same device number. Note: Installations with launch scripts for V3 Combiner will need the additional GRD inserting into the boot sequence before Combiner32 is launched.

The Combiner is an 'automatic' application that converts a single Router Crosspoint (RC) command into a salvo of commands to a number of other devices. GPI's and InfoDrivers can also be included in packages. Theoretically any device on the BNCS network can be addressed via a package.

Combiners can be used to provide married and breakaway routeing of associated video and audio routers

- Simple manipulation of the Combiner MASK allows breakaway routeing
- Associations between audio and video paths can be managed centrally, so control panels don't have to maintain this information

Combiners can be used to "package" temporary or daily feeds for presentation to end users

- Multi-level feeds: video/audio/comms from an external source (eg. OBs)

The configuration of the packages is held in InfoDriver slots and can be dynamically modified to assemble new packages.

Combiners can be used to associate forward and return feeds of a signal to a shared resource. The combiner is able to make reverse routes by having sources in destination packages and vice versa.

1.2 Device interface description

Combiner32 uses a host GRD and 3 host InfoDrivers, one for source packages, one for destination packages and one for level mapping. All the host drivers must be running on the same workstation before starting the Combiner. The Combiner connects to the host GRD of the same device number; the device numbers for the InfoDrivers are defined in the Combiner section of the Dev_xxx.ini file. The host drivers forward the RC/IW commands to the Combiner and process the other background tasks such as Poll, Query, Locking and the sending of revertives.

If required, commands can be pre-processed by intercepting them with an External Client application that is connected to the host GRD. The output commands of the Combiner can be further processed by passing them through an external dll.

Additional instances of the Combiner system can be run on separate workstations and the TxRx/RxOnly modes of the support drivers are controlled by the Combiner. The active TxRx instance of the Combiner can be selected remotely by sending NetStatus messages (Applcore ES command) or directly from the 'Redundancy' switching menu.

1.3 BNCS configuration

Combiner32.exe is compatible with BNCS V3, V4 and V4.5.

The configuration file paths are taken from:

CC_ROOT variable not present:	Using **bncs_config.ini** file located at system root e.g. [Config] ConfigPath=C:\BNCS\PROJECTNAME\CONFIG else Windows directory (taken from WINDIR environment variable) typically **c:\winnt**
CC_ROOT variable present	BNCS root path then config\system e.g. <CC_ROOT>\<CC_SYSTEM>\config\system typically **c:\BNCS\v4.5\config\system**

There are no other changes between BNCS/CC systems/versions

2 Driver setup

Combiner32 receives its commands via the host GRD and performs the routing based upon the package information stored in Infodriver slots and the 'Level' configuration loaded from its Dev_xxx.ini file.

To configure a new system, create four database profiles (DEX_xxx.INI) for the device Ids you intend to use with the Combiner. No two drivers on the network may use the same number and they must be between 1 and 999.

COMBINER32.EXE takes a single command line parameter. This is the same device number as the host GRD to which the package execution commands are to be sent. When first run it will create the configuration sections for the Combiner in the Base Id DEV_xxx.INI file and populate all the slots of the Level Mapping Infodriver with default mapping.

The GRD and hence the Combiner can be instructed, either locally at the driver application or by using the 'RL' command over the network, to inhibit or lock out any destination or range of destination packages. However, the status of destination locks within the GRD cannot be polled or queried, other methods such as running a separate 'Lock' infodriver are often used instead to store the destination lock status.

2.1 Ini file settings

The Base Id DEV_xxx.INI file contains all the configuration settings for the Combiner. In addition to the database sections used by all drivers, the Combiner has three sections of its own.

- [Combiner] contains the global parameters for the application.
- [Levels] where the attributes of each controlled level are defined.
- [Masks] where the levels within a package type can be defined and given a name.

The GRD section of the ini file also needs to be configured to host to an external application.

During initial setup the support driver Id's are generated automatically based upon the base Id supplied as a command line parameter.

Item	Value	Comment
[Combiner]		
SrcePkgInfoId	*Base Id +1*	Driver Id of the source package InfoDriver. The default value is base Id +1.
DestPkgInfoId	*Base Id +2*	Driver Id of the destination package InfoDriver. The default value is base Id +2.
LevelMapInfoId	*Base Id +3*	Driver Id of the Level mapping InfoDriver. The default value is base Id +3.
RevertiveLevel	0	If this is other than zero revertives will only be generated from the Combiner if the mask command contains the specified level. Valid levels are 1 through 32.
ExternalDll	NONE	The combiner will try to hook into the specified dll if it can be found in the windows path, if not the combiner will continue to operate as normal.

2.2 Level Configuration

There can be up to 32 levels. Each level has an entry in the ***[Levels]*** section of the Combiner DEV_xxx.INI file. Each entry consists of a comma delimited list of attributes. The first three are mandatory as they are required for the Combiner to function. Any other data that follows the first three attributes is ignored.

2.2.1 Level Direction

The first attribute is the direction of the level. If set to 'F' for Forwards, the Combiner will execute the level routing normally i.e. *Source to Destination*. If set to 'R' for Reverse the level will be executed *Destination to Source*. This feature enables sources to be put into destination packages and vice versa.

2.2.2 Level Type

The Combiner is able to execute Routing, GPI switching and writing to Infodrivers. The second parameter should be set to '*R*', '*G*' or '*I*' respectively.

2.2.3 Driver Number

The third parameter is the driver Id. The driver may be one of the generic types such as GRD, GPID_722, GPID_725 and INFODRIV, or may be a complex driver or controller.

An example of the first 6 levels is shown below.

[Levels]

Level_01=F,R,1	This level executes routes in a forward direction on driver 1.
Level_02=F,G,55	This level executes GPI's in a forward direction on driver 55.
Level_03=F,I,201	This level executes InfoDriver writes in a forward direction to driver 201.
Level_04=R,R,406	This level executes routes in a reverse direction on driver 406.
Level_05=R,G,111	This level executes GPI's in a reverse direction on driver 111.
Level_06=R,I,6	This level executes InfoDriver writes in a reverse direction on driver 6.

2.3 Mask Configuration

The mask allows only given levels of a package to be executed. Normally this is supplied in the Router Crosspoint command as follows:-

RC 680 27 311 '1, 4, 8’

This command is an instruction to Combiner 680 to route source package 27 to destination package 311 on levels 1, 4 and 8. Other levels in the source and destination packages will be ignored. Alternatively the mask maybe specified as follows:-

RC 680 27 311 'FULLFACS'

Here 'FULLFACS' is an entry in the [Masks] section of the Combiners DEV_xxx.INI file.

Up to 32 unique masks can be defined. Blank entries are ignored when the list is loaded and the first entry with a matching mask name will be used during normal operation.

[Masks]

Mask_01=FULLFACS,1,2,3,4,5,6,7,8	Using this mask would execute levels 1 through to 8.

Mask_02=LISTEN,1,2,3	Using this mask would execute levels 1, 2 and 3 only.
Mask_03=FACSONLY,6,7,8	Using this mask would execute levels 6, 7 and 8 only.

Mask 33 has been coded as an internal mask '---' that is preset to execute all levels; this will automatically catch the default mask name appended by Applcore. To override the preset mask action simply configure another mask as '---' with the required levels.

Mask 34 has been coded as an internal mask 'XC' that is preset to execute all levels. Applcore eXternal Crosspoint commands do not pass a mask parameter; the mask name is automatically appended to each received XC command prior to normal processing. To override the preset mask action, simply configure another mask as 'XC' with the required levels.

2.4 GRD Configuration

The GRD section of the base Dev_xxx.ini file is also used by the Combiner as some entries are common. The DriverMode, NetUpdateOnStart and Simulation entries have to be specifically configured to host to an external application and these settings are checked by Combiner32.exe during startup.

Item	Value	Comment
[GRD]		
Name	*Main Packager*	The name of the Combiner is displayed in the title bar.
DriverMode	EXTERNAL	Forward received commands and resilience messages to the external Driver application.
NetUpdateOnStart	0	Instructs the GRD to use the tally data from its dat file after a restart as the Combiner is unable to provide a tally refresh from any other external device.
DebugMode	0	If set to 1, additional debugging information is sent to the console
NameLength	8	The character width of the source and destination package list boxes.
Simulation	0	Normal mode using internal protocols or external app.

2.5 Security Configuration

The Security section of the base Dev_xxx.ini file is also used by the Combiner. The workstation parameter of the received network (RC) or external (XC) command is checked against the Access list.

Item	Value	Comment
[Security]		

Item	Value	Comment
Access	1,9,12-20	The Combiner will only accept commands from workstations 1, 9 and 12 through 20. The default setting is 'ALL'.

2.6 Infodriver Configuration

The Combiner connects as an External driver to the 3 host Infodrivers, it does not require any changes to the default Infodriver settings.

3 Package Configuration

3.1 Introduction

The source and destination packages are contained in corresponding InfoDriver slots. The format of a package is a comma delimited list of numbers. The numbers themselves refer to source or destination indices. The order in which the numbers appear corresponds to the device levels specified in the Combiners DEV_xxx.INI file. All levels must be specified. If a level is to be omitted then a '-' should be used in place of a source or destination. A zero indicates that the GRD at the end of the chain should substitute its park source.

A package can be dynamically modified by polling the source or destination InfoDriver slot as appropriate, splitting up the string into individual numbers, modifying those that need changing, rebuilding the string and writing it back to the same slot.

3.2 Operation

The Combiner receives a Router Crosspoint command addressed to its device number, containing the indices of the source and destination packages to execute together with a 'mask' of levels on which to make the routes. e.g. if the Combiner's Id' was 680:-

RC 680 34 198 '1,2,3,14,15'

This would route source package 34 to destination package 198 on levels 1, 2, 3, 14 and 15. If valid sources and destinations exist in the packages for those levels then the Combiner will generate individual RC commands for them. If some levels have been configured in the Combiner's DEV_xxx.INI file to be GPI's or Infodrivers then the appropriate GS and IW commands will be generated.

If the execution of the source to destination package results in any commands being generated, the Combiner will return a tally for that destination package.

3.3 Destination Level Mapping

The Combiner enables the destination levels of a package to be mapped to other levels. This means that levels sharing the same physical hardware for different functions can map the functions onto one another. For example, if levels 3 & 4 are main audio feeds and levels 5 & 6 are clean effects then, providing the same physical router is being used for all the levels, the main audio and clean effects can be swapped over by mapping one level to another without changing the contents of the destination package.

InfoDriver slots are used to hold the destination level mapping in the form of comma delimited lists. The order in which the numbers appear corresponds to the device levels specified in the Combiner's DEV_xxx.INI file. The numbers themselves represent the levels to map on to. The default is a one for one relationship and the Combiner will initially fill the level mapping InfoDriver slots with:-

1,2,3,4,5,6,7,8,9,10,11,12,13,….,32

3.3.1 Level Mapping example

The simple four level example below illustrates how the mapping can be used. All levels are forward routing. The Id of the Combiner is 680 and the router Id's for the four levels are 201 through 204.

Slot contents	Information and Values of Slot
11,22,33,44	Source Package 2
111,222,333,444	Destination Package 4
1,2,3,4,5,6,7,8 etc	Destination Mapping 4

The command **RC 680 2 4 '1,2,3,4,'** would generate:

RC 201 11 111

RC 202 22 222

RC 203 33 333

RC 204 44 444

Change the contents of the destination mapping slot to **3,4,1,2,5,6,7,8** etc

The command **RC 680 2 4 '1,2,3,4,'** would now generate:

RC 201 11 333

RC 202 22 444

RC 203 33 111

RC 204 44 222

4 External Client

The host GRD can also accept a direct connection from an External Client application such as an Applcore automatic that can be used to pre-process the received network commands.

All client commands from the network to the host GRD are initially forwarded to the external client where they can be intercepted, modified or discarded before they are returned to the host GRD and then to the Combiner. For example, an external client could conditionally inhibit specific packages such as test signals, radio check receivers etc from

being routed to a transmission destination or even route an alternative package, based on the state of an external BNCS device (gpi/route/slot).

Note: Applcore can only intercept a limited range of commands see 'V3Applcore eXternal Driver Interfacing.doc'.

5 External DLL

The Combiner will try to hook into the specified DLL if it can be found in the windows path, if not the Combiner will continue to operate as normal. The filename of the loaded DLL is displayed in the bottom corner of the main dialog under the Output command list.

While the Combiner is 'Tx/Rx', the output commands are initially offered to the DLL for external processing and onward transmission. The external DLL should return TRUE if the command is accepted for processing, otherwise the Combiner will continue to validate (range check etc) the command internally before sending it to the network.

Example usage - W1 Lawo router expansion goes beyond the BNCS limit of 4096 destinations and consequently uses secondary device numbers. The Lawo specific commands from the Combiner are filtered and re-directed to the appropriate devices by an external DLL.

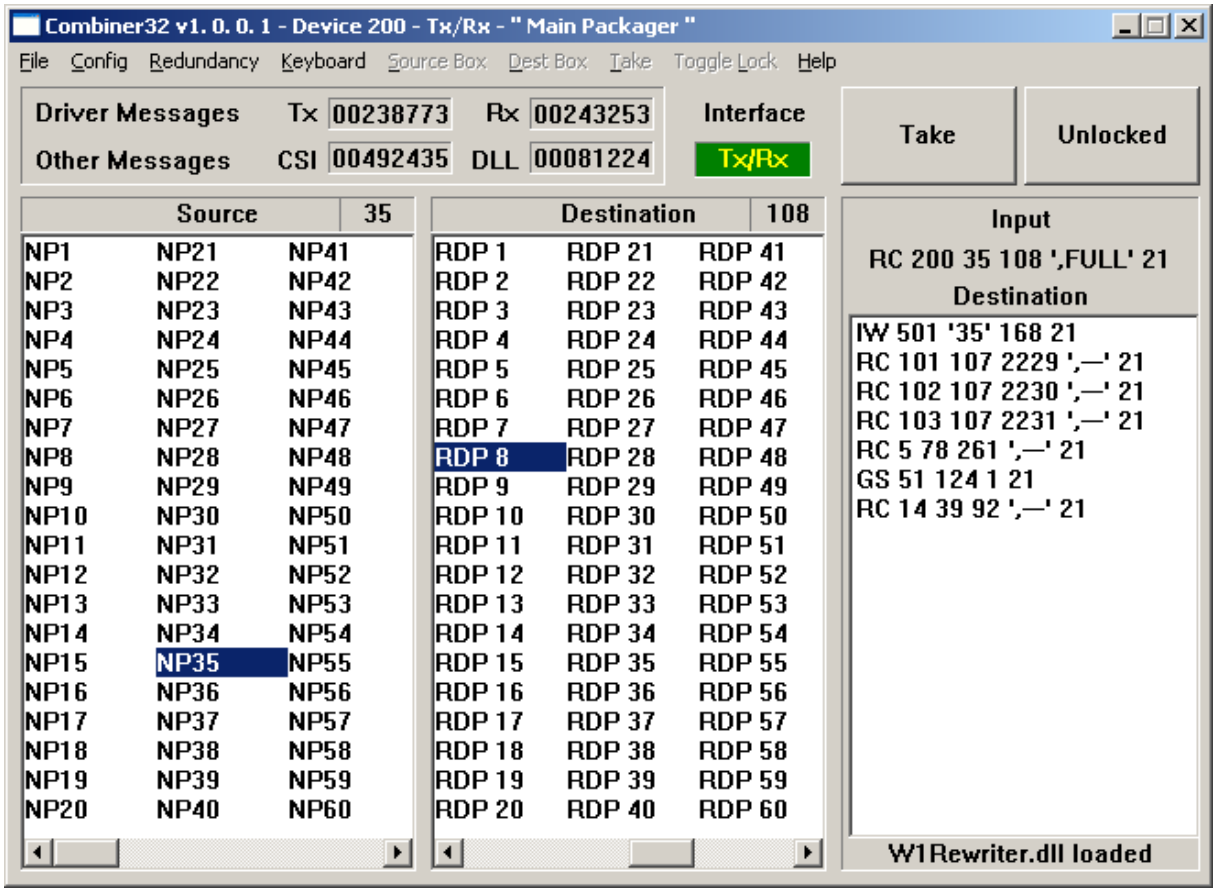
6 Redundancy

Combiner32 manages the redundancy modes of its support devices. Mode change requests from the Infodriver dialog menus or targeted NS/ES commands to the Infodrivers are refused by the Combiner. Redundancy mode changes should be directed at the main device number only or selected locally from Combiner32 dialog menu.

During startup the host GRD mode is checked. If the GRD is 'RxOnly', the Combiner will attempt to set the GRD to 'Tx/Rx' and after a short delay the GRD mode is re-checked, in case there has been an objection from a 'TxRx' device elsewhere on the network. The Infodrivers are then synchronised to the same mode as the GRD.

At closedown the host GRD is set to 'RxOnly' to invite a reserve Combiner to immediately take over as the 'Tx/Rx' device.

7 User Interface



The Title bar displays: Device No. - Current interface mode - Combiner "Name" from ini file.

The message counters at the top show the number of messages received and transmitted by the driver to and from the host drivers and CSI; these do not include the background housekeeping and resilience messages.

If the Interface label shows 'RxOnly' it indicates that there is another device with the same device number on the network in 'Tx/Rx' mode.

The 'Sources' section displays the names of all available source packages in a scrollable listbox and the index number of the highlighted source is displayed above. A source will be highlighted if it is routed to the destination selected in the 'Destination' section and is also used to select a new source package for subsequent routing to a destination.

The 'Destination' section displays the names of all available destination packages in a scrollable listbox and the index number of the highlighted destination is displayed above. Selecting a destination will highlight it and will also highlight the current source package feeding that destination, if any, in the source listbox. Another source package may be selected and routed by pressing the 'Take' button. If the destination is locked then it is necessary to unlock it first by pressing the 'Locked' button, which will enable the 'Take' button.

The Lock button and menu Toggle Lock tab toggle the lock status of the selected destination. Note: Lock status cannot be determined remotely.

The dialog 'Take' and 'Lock' buttons are operational even when Combiner32 is 'RxOnly'. The corresponding RC and RL commands are forwarded to the host GRD's externally via the network and can be logged, an External Client would process the received commands as normal. The 'RxOnly' instance will update its tally or lock tables and the 'Tx/Rx' instance will also issue the package commands on to the network.

The 'Information' section displays the received routing command and the individual output commands required to assemble the package, one for each level and these will be sent in a salvo to the network if 'Tx/Rx'. The Combiner can be configured to use an external DLL to further process the output commands, the name of the loaded DLL is displayed at the bottom of the panel and the DLL message counter will show number of commands successfully processed by the DLL.

The 'Config' menu calls a pop-up window showing the configuration path used by the Combiner with an option to open the configuration ini file with the default text editor.

The 'Redundancy' switching menu allows the user to locally force the Combiner and host drivers into 'Tx/Rx' or 'RxOnly' mode for testing or maintenance purposes.

If a keyboard is available you can enable keyboard router control from the menu bar or by using <Alt> 'K' 'E'. Once enabled, the keyboard and navigation keys can be used to change package routes, use <Alt> 'D' to select the destination box, <Alt> 'S' to select the source box and <Alt> 'T' to route the new package. <Alt> 'L' enables the locking and unlocking of individual destinations. With the keyboard disabled on the main menu only monitoring is possible.

The names displayed in the 'Source' and 'Destination' listboxes are populated indirectly from the Dev_XXX.CDF file which is maintained by CSI from the names held in databases 0 & 1 of the Dev_XXX.INI file.

8 Version history

8.1 Driver version

Version No	Date	Details	Name
V1.0.0.0	23/10/12	Ported from V3Cmbine v3.05.03 into MS VC6 Removed dependency on Borland CCs Keyboard control menus now 'greyed out' after being disabled & menu 'Take' is linked to Lock status Message scheme converted to BBC_COPYDATA (dll)	Steve Lowe

V1.0.0.1	10/01/13	Ported into MS VS2010. Runtime libraries 'msvcp100.dll' and 'msvcr100.dll' are both required in the windows path. Adds dialog panel to view Config file path and open dev.ini file in default editor. Version information for About window and titlebar now extracted from resource file. Removed unused config setting for 'Simulation' mode. Removed unused menu option 'Clear Errors' Adds command line device number check. Creates mutex to prevent another instance overwriting the external driver registrations. Converted to use External GRD host, polls/queries etc now handled by GRD. Listbox updates now processed individually using the names passed in RM command. Replaced static 64 command deep buffering with dynamic buffering. Now handles XC commands as forwarded by host GRD with External Applcore client attached. Adds internal default masks '---' and 'XC' set to ALL levels, use identical name in mask config to override. Adds Redundancy switching menu and handling for Infodriver external redundancy requests. Dialog 'Take' and 'Lock' buttons now issue RC/RL commands on to network to synchronise the tally and lock tables of an 'RxOnly' instance.	Steve Lowe
V1.0.0.2	21/02/13	Changes text in About box	Steve Lowe
V1.0.0.3	10/04/13	Rationalises duplicated configuration entries Swaps title elements to improve task bar legibility	Steve Lowe
V1.0.0.4	18/07/13	Fixes Security access parsing (#2378) Cosmetic changes (#2379), Removes default mask for XC commands(#2380)	Steve Lowe
V1.0.0.5	14/10/13	Checks setting of GRD option 'NetUpdateOnStart=0' to ensure the GRD uses tally data from the dat file after a restart.	Steve Lowe

8.2 Document version

Version No	Date	Details	Name
1.00.00	10/01/13	App name and branding changes, saved as Combiner32.doc	Steve Lowe
1.00.01	24/01/13	Document reviewed and minor edits	Steve Lowe
1.00.02	21/02/13	Version updates	Steve Lowe
1.00.03	10/04/13	Version updates	Steve Lowe
1.00.04	18/07/13	Version updates and new Security configuration section	Steve Lowe
1.00.05	14/10/13	Version Updates	Steve Lowe
1.00.06	15/10/13	Corrects GRD NetUpdateOnStart config value	Steve Lowe

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