NEMESIS

ACS-1 v1.0 **AUTO CONTROL SWITCH**

ACS-1
AUTOMATIC CONTROL SWITCH

USER GUIDE

Overview

The Nemesis ACS-1 is a switching extension module for any GPI remote controlled audio or media switching system where an analogue reference signal is present

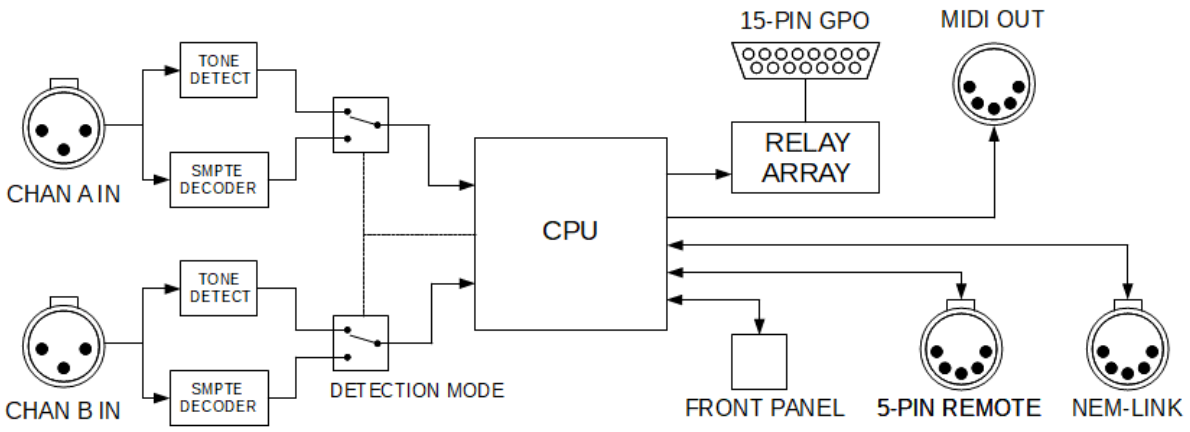
Primarily designed to work with the DANTESW-1 which has no front panel switching control of its own, the ACS-1 provides both a manual and automated method of switching between a main and backup playback source. The unit is able to detect and analyse an analogue reference signal fed back from the DANTESW-1 to determine whether a playback source is present and in a stable state of operation and will automatically switch to a backup source if the condition changes.

The base firmware of the unit contains 2 switching algorithms, a 'legacy algorithm' which will initiate a switchover the moment the reference signal from the main system disappears or is determined to be invalid, and a 'compare algorithm' which will initiate a switchover when the main and backup systems are in an unmatched state. This prevents unnecessary switching at the ends of tracks/pauses in playback material etc.

The unit also contains 2 detection systems, a standard 'tone' detection, and an advanced 'SMPTE tracker' to determine the state of each source, overcoming the traditional problems of stuck playback buffers failing to trigger a switchover when monitoring tone alone.

There are also full remote link options for integrating the unit with the Nemesis CCS-2 computer switchover system allowing a complete fully redundant, automatic switching solution to be deployed.

Diagram of Internal Operation



Front Panel

Autoswitcher

ENABLE: Toggle the autoswitcher system on and off. When off, the ACS-1 will not automatically switchover to the backup system in the event of failure, although the manual front panel buttons will still be operational.

ACTIVE: Indicates the state of the autoswitcher: Green – autoswitcher is active, Red – autoswitcher is bypassed.

Detection Mode

SELECT: Choose the detection method to use. Wherever a SMPTE signal is available this is the recommended option as it provides a much more intelligent detection system. If only a simple audio tone is available as a reference then TONE should be selected. See *Modes of Operation*.

SMPTE/TONE: Indicates the current detection system in use. Green – SMPTE, Yellow – TONE.

Input Status

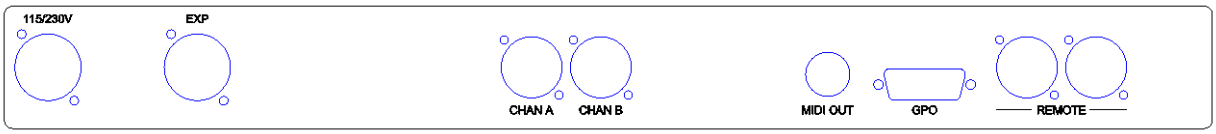
SIG A PRESENT: Indicates the state of the channel A source. Green – A valid reference tone or SMPTE timecode signal has been detected. Red – A reference tone is below the threshold, not present or the SMPTE signal is invalid or not present.

SIG B PRESENT: Indicates the state of the channel B source. Green – A valid reference tone or SMPTE timecode signal has been detected. Red – A reference tone is below the threshold, not present or the SMPTE signal is invalid or not present.

FRONT SWITCH A: Manual selection of the channel A source. Illuminates to show this is the current selection (factory fitted with a green cover).

FRONT SWITCH B: Manual selection of the channel B source. Illuminates to show this is the current selection (factory fitted with a yellow cover).

Connections



AC MAINS – Powercon™ connector to connect to the Mains supply. The internal power supply is capable of running on 100-240VAC 50/60Hz.

EXP: Future expansion port, not fitted to all models.

CHAN A: Balanced XLR input for channel A reference signal (commonly the 'main' playback source). This reference source can either be a tone or a SMPTE timecode signal as described later in this manual.

CHAN B: Balanced XLR input for channel B reference signal (commonly the 'backup' playback source). This reference source can either be a tone or a SMPTE timecode signal as described later in this manual.

MIDI OUT: 5-pin DIN connector available for MIDI out data in custom firmware implementations. Contact Nemesis Audio for further information.

GPO: 15-pin D-Sub connector for relay changeover connections activated during each switchover operation. There are 4 independent relays, the connector allowing access to NO and NC contacts, as well as the COM terminal. Relays 1+3 will 'pulse' closed for 200ms during a 'switch to A' operation, and relays 2+4 for a 'switch to B' operation, emulating a manual button press. See *Technical Specifications* for pinout details.

Remote:

5-PIN REMOTE: Female 5-pin XLR connector for standard Nemesis Remote Switchover boxes allowing the front panel buttons to be remoted away from the unit.

NEM-LINK: Male 5-pin XLR connector for connection to the Nemesis CCS-2 Computer Switch, allowing pass-thru of the 5-Pin Remote signals as well as the automatic switchover.

Getting Started

Basic operation of the unit will require a suitable 15-pin D-Sub to audio device remote connector cable to be wired up. Nemesis Audio provide pre-wired cables for compatible devices, although any switching device which has a GPI closed contact remote input can be used. Once the ACS-1 and the remote device are linked the front panel buttons will be able to control the audio device. If this is wired to the Nemesis CCS-2 with a suitable preset as part of a complete system then the audio device should now switchover at the same time as the Keyboard, Video and Mouse signals.

If the automatic switching system is also required then an analogue reference signal will be required from each playback source. In the case of the DANTESW-1, this is provided by the 4-way XLR card on the rear of the unit. The 2 reference signals should be connected to the ACS-1, usually with channel A connected to the 'main' playback source and channel B connected to the 'backup' playback source.

The reference signal can be generated a number of ways, common methods when using a DAW or multitrack playback system include recording a 1kHz constant tone onto one of the tracks/outputs, or for more advanced fault detection a SMPTE timecode signal can be used, also recorded on to one of the tracks. In the case of a DAW playback source, this may be able to generate SMPTE directly and so this signal can be used as the reference signal.

It should be noted that the reference signal seen by the ACS-1 should be the tone or SMPTE signal only and no other content should be present on that connector in order to achieve reliable fault detection.

For more information on the difference between tone and SMPTE detection see *Modes of Operation.*

Modes of Operation

The detection mode is selected from the front panel, and can be switched between 'TONE' and 'SMPTE'.

1) **TONE mode** – The status of each input channel is determined by the presence of an audible signal – most commonly a 1kHz reference tone above the threshold level. When the tone is detected the source is determined as 'OK' and the corresponding channels status LED will be green. Below this threshold level the source is determined to be faulty or missing and the channel status LED will be red.
2) **SMPTE mode** – An advanced time-tracking algorithm. The ACS-1 is able to read the embedded timecode in a SMPTE signal from each source. This could be a SMPTE striped wave file on a multitrack or the sync output from a DAW. Each input buffer will take 2-4 frames to lock on to the incoming time reference, and continually monitor it for an abnormality. If the signal disappears, or the time jumps backwards (such as a stuck-buffer scenario when using a computer DAW) the channel source is no longer marked as OK and if this occurs on the 'main' machine, a switchover will be initiated. The corresponding channel status LED will turn red. Once 4 consecutive frames have been received on the channel again, the source status will return to 'OK' with the channel status LED turning green again, although the unit will remain on the backup source unless manually returned to the main.
   SMPTE is considered to be 'OK' once the first 2-4 frames have been received and current timecode position and fps have been established - the ACS-1 will expect to see the timecode advancing frame by frame in a forward direction. If any framing errors occurs, or the received timecode position is less than the previous timecode position it is assumed that an error has occurred.
   It should be noted that this does not preclude looping playback to be achieved with the ACS-1 in system, since if both units are tightly synced then both sources will become invalid at the same time and the compare algorithm of the ACS-1 will not initiate a switchover in this scenario. Care should be taken when working in this mode however, as depending on the loop position the unit may lock on to the backup unit quicker than the main, resulting in an unnecessary switchover, so this should be fully tested before production.

Switching Algorithms

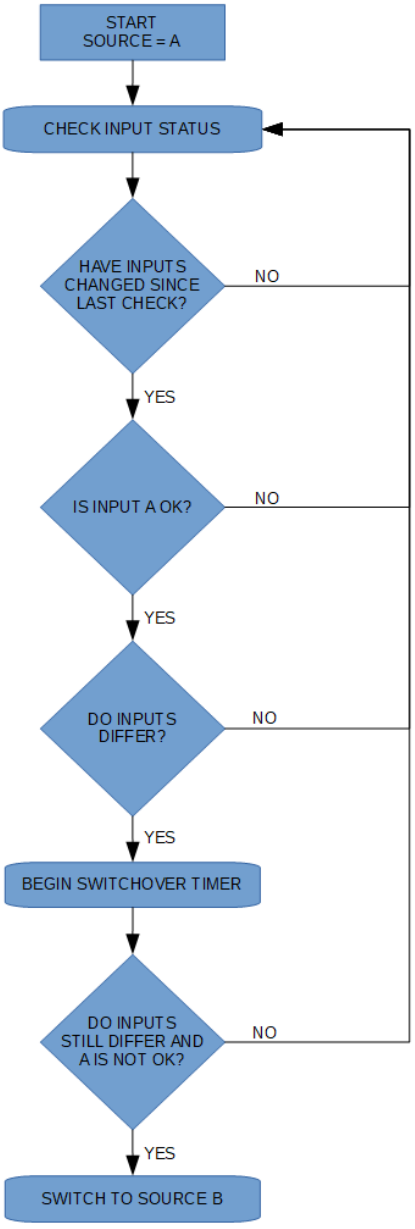
The base firmware of the ACS-1 contains 2 fault detection and switching algorithms which can be tailored to best suit the user's needs.

The default switching algorithm is based on a 'compare' method, although this can be switched to a more traditional 'legacy' mode by using the internal jumper selection. See *Internal Options*.

Compare Algorithm: The ACS-1 continuously monitors the status of each input channel, and designates input A as the 'main' or primary source. If at any point in time there is change in the state of the inputs the validity of source A is checked. If A is still seen to be healthy and a fault has developed

on B, the ACS-1 will take no action although will warn the user there is a problem by changing the front panel status LED to red.

If however, there is a fault seen on the A input, the ACS-1 will run a 'timed compare' routine, whereby the input is flagged as potentially problematic and a short timer is initiated. Once this timer has expired (after roughly 50ms), the inputs are once again checked. If input A is seen to now be OK no further action is taken but if it is still problematic the state of input B is now checked. If this input is also showing a fault, the ACS-1 will assume playback has ended or transport controls are in use and no further action is taken. If, however, input B is OK the ACS-1 will initiate a switchover to source B.



Once a fault has been detected and the ACS-1 has switched to the backup source, it will not automatically switch back to the primary source as this allows the user time to investigate the problem

and be certain the source is reliable before/if running from this again. So in effect the above algorithm will sleep until it is manually switched back to A and the process begins over again. There are certain exceptions to this condition – see *Internal Options* for more information.

The short timer is employed to prevent fast unnecessary switching between sources during pause/track end/transport situations when both machines aren't perfectly in sync. For example, if the backup machine was a few ms behind the main machine, if playback ended on the main and the reference signal disappeared then the ACS-1 would initiate a switchover immediately, based on the remaining few ms of reference tone from the backup, which would be an unnecessary switchover, and rely on the operator having to manually switch back to A.

Use of this algorithm will provide the user with the benefits of a fast acting autoswitcher whilst also allowing some degree of tolerance with respect to rewind/forward search actions, looping playback and silence between playback sections without needless switching.

Legacy Algorithm: This switching method is based on a simpler and more traditional approach. The ACS-1 continuously monitors channel A only, and as soon as the reference signal disappears or a SMPTE fault is detected, a switchover to channel B is initiated. The ACS-1 doesn't check the current status of channel B, and will switch immediately.

The advantage of this method is the switching is more instantaneous because there is a no switchover timer involved, however there may be an increase in unnecessary switchover operations during playback pauses, track ends, etc. It will not be possible to use looping playback with the SMPTE detect method when using this algorithm either because the system will be unable to compare with the second machine and see the same timecode jump when entering the loop.

If extremely fast switching is of high importance this algorithm is the one to use although for general use we recommend the compare algorithm because of all the additional benefits this brings, and still with a very acceptable response time.

Internal Options

There are 3 internal jumpers for settings further configuration options not available from the front panel. The unit should be re-booted after changing any of these settings.

JP1 1+2 – LEGACY MODE: Setting this jumper to ON will set the unit to use the 'legacy' switching algorithm as described above. Leaving the jumper off will use the default 'compare' algorithm.

JP1 3+4 – BOOT IN LAST ENABLED STATE: By default the unit will always boot into the 'Autoswitcher Enabled' state, even if the system was bypassed on the last use. Setting this jumper to ON will ensure the unit remembers its last state during power cycles. This may be useful during rehearsals and technical periods, although during show time we recommend to ensure the unit always boots to the enabled mode. Other settings such as TONE/SMPTE are always recalled.

JP1 5+6 – AUTO RETURN TO A IF A IS PRESENT AND B IS MISSING: By default the ACS-1 will not auto return to the A input even after a fault has been detected and cleared. This allows the operator to decide whether the main system is now reliable again. However, there may be times in long running

or un-manned installations when staying on the backup source without manual intervention may not be desirable in case this source fails too. With this jumper set to ON the ACS-1 will continue to monitor input status even after a switch to B, to ensure B is OK. If a fault is found with B and A is OK, the ACS-1 will auto-return back to A and employ the standard compare algorithm again.

This jumper has no effect in the legacy mode as it will always return to A once a valid reference signal is detected.

Technical Specifications

Mains Input Voltage: 100-240VAC 50/60Hz
Rated Power: 25W
Input Threshold, SMPTE signal: .....-27dBu
Input Threshold, Tone signal:.....-35dBu
GPO Relay Contact Rating: 1A, 125VAC, 60VDC
GPO Output Power Rating: .....12V @ 500mA
5-Pin Remote Relay Contact Rating: ..... Closed Contact to Ground, 1A
Equipment Dimensions (HxWxD): 44x482x270mm
Weight: 1.8Kg

Internal Jumpers

Label	On
JP1 1+2	Legacy Mode
JP1 3+4	Boot in last 'Enabled' State
JP1 5+6	Auto-return to A if A is present and B missing

Connector Pinout

GPO: 15 Pin Female D-Sub. Relays 1-4, Normally Open, Normally Closed and Common connections available. Switching rated to 1A. Also provides external 12V power, rated to 0.5A.

1	RLY1 NC
2	RLY1 COM
3	RLY1 NO
4	RLY2 NC
5	RLY2 COM
6	RLY2 NO
7	12V 500mA
8	NC
9	RLY3 NC
10	RLY3 COM
11	RLY3 NO
12	RLY4 NC
13	RLY4 COM
14	RLY4 NO
15	GND

REMOTE: 5-PIN FEMALE XLR

Connection	Pin Number
Common (12V)	1
Switch B (Close to 12V)	2
Switch A (Close to 12V)	3
Lamp B (Relay Contact to Internal GND)	4
Lamp A (Relay Contact to Internal GND)	5

NEM-LINK (For CCS-2): 5-PIN MALE XLR

Connection	Pin Number
Common (12V)	1
Switch Relay B	2
Switch Relay A	3
Switch B (Opto-Isolated)	4
Switch A (Opto-Isolated)	5

Notes:

*This manual is based on ACS-1 Firmware v1.0.

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