

crystal standard configuration

User Manual

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1. Introduction

Welcome to **crystal standard configuration**.

About this Manual

This document describes how to install, configure and operate the system.

Look out for the following which indicate:

Notes - points of clarification.

Tips - useful tips and short cuts.

Attention - alert you when an action should *a/ways* be observed.

Further Information

Mechanical drawings and data sheets (including weights and dimensions) are available from the **Download-Center** (after login).

Lawo User Registration

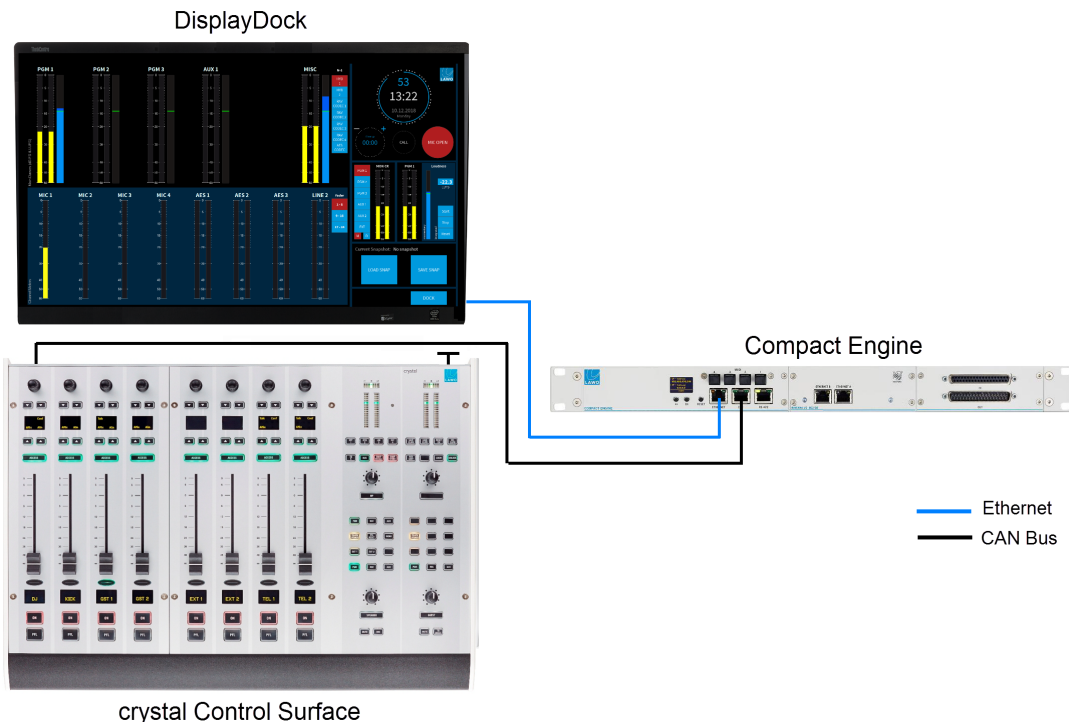
For access to the **Downloads** area and to receive regular product updates, please register at:

www.lawo.com/registration.

2. Important Safety Instructions

Please observe all of the instructions provided in the "General Safety Information for Lawo Equipment" booklet delivered with your devices. Double-click [here](#) to open the information as a pdf.

3. Product Overview



crystal standard configuration is a live mixing console for radio. It consists of three components: Compact Engine, crystal control surface and DisplayDock. The system is available in two editions: Fader Start or Button Start.

The control surface comes in a range of frame sizes and connects to the Compact Engine via CAN bus. DisplayDock runs on a Windows PC connected to the Compact Engine via Ethernet. The host PC must be provided by the customer. Suitable CAT5 cables are provided for the CAN bus and Ethernet connections.

The Compact Engine handles all of the signal processing, system control and IO connections. The IO comprises:

- **Analog IO:** 4 Mic/Line in, 4 Line in, 8 Line out, 2 Headphone out.
- **Digital IO:** 4 AES3 in/out, 1 x 64-channel MAD1 (with main and redundant connections).
- **AoIP:** 1 x RAVENNA/AES67 interface (configured for 32 stereo Rx/Tx streams).
- **Expansion IO:** either 4 AES3 in/out (Fader Start) or 8 Line in/out (Button Start).

All active sources can be mixed to three stereo main outputs: **PGM 1 to 3** and two stereo auxes: **AUX 1 and 2**. The active sources are the ones assigned to the fader strips, and so the maximum number of mix inputs is determined by the console frame size.

Any available source can be assigned to any fader strip, allowing you to change the layout of the surface and mix different inputs. Sources come with a fixed complement of DSP which varies depending on the source type. For example, all MIC sources provide AutoGain, EQ & Filters, Dynamics (Gate, Expander, Compressor), De-Esser, AutoMix and Limiter. They also support other functions such as talkback, mix minus creation and PFL/CUE monitoring. Parameters can be adjusted either from the control surface or DisplayDock GUI.

For monitoring, there are two stereo speaker outputs (for the control room and studio), and two stereo headphone outputs (for the DJ and Guests). Two output meters are always visible: follow MONITOR and PGM 1. To meter inputs and other outputs you can switch to the "Metering" page.

The master functions on the right of DisplayDock include a system clock, timer, mic open indicator and telephone call signaling. Other pages include "Source Parameters" (for DSP control) and the "Advanced" page (with global options and local matrix).

To store and recall settings, the system supports five local memories (stored on the Compact Engine) plus an unlimited number of DisplayDock snapshots (stored on the control PC).

4. The Hardware

This chapter describes the hardware components and options.

Topics include:

- [Console Editions](#)
- [Control Surface Variants](#)
- [The Compact Engine](#)

4.1 Console Editions

crystal standard configuration is available in two editions: **Fader Start (FS)** and **Button Start (BT)**. They differ in the following ways.

Fader Strip Controls

The two large keys at the bottom of the fader strip provide:

- Fader Start (FS) - channel **ON**/off and **PFL**
- Button Start (BT) - channel **ON** and **OFF**

The soft key MF2b provides:

- Fader Start (FS) - **AMix** (auto mix enable).
- Button Start (BT) - **CUE** (pre-fade listen).

On a Button Start console, Auto Mix can be enabled from DisplayDock (or the surface Dynamics controls) when a source is in access. See [AutoMix](#).

Channel On/Off Operation

On Fader Start consoles, the channel "on" state is conditional on the fader position.

On Button Start consoles, the channel "on" state is independent of the fader position.

The behavior is described in more detail [later](#).

PFL / CUE

The pre-fade listen function is named **PFL** on Fader Start console and **CUE** on Button Start consoles. There are also some differences in the default behaviour (explained [later](#)).

Front Expansion IO Slot 2

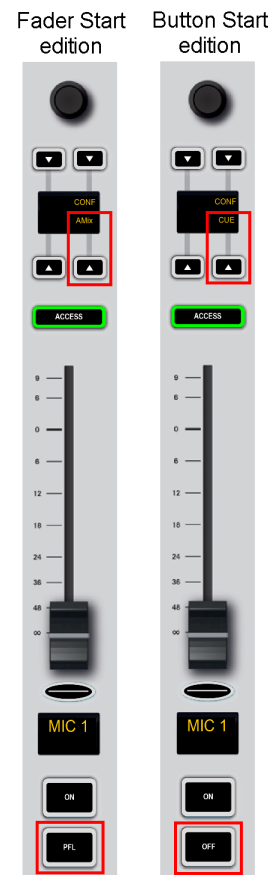
The right-hand expansion slot at the front of the Compact Engine is fitted with different IO cards. This provides either more digital or more analog IO:

- Fader Start (FS) = 1 x AES3 IO Card (4 AES3 in/out)
- Button Start (BT) = 1 x LINE IO Card (8 Line in/out)

Reference Levels

The editions use different [reference levels](#) as follows:

- Fader Start (FS) = DIN
- Button Start (BT) = SMPTE



4.2 Control Surface Variants

4-fader single frame



12-fader single frame



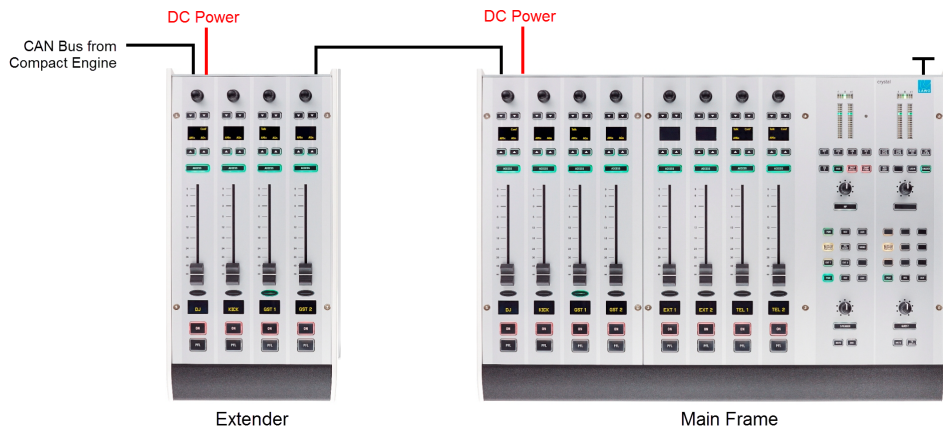
crystal can exist as a single or split-frame control surface.

A choice of five main frame layouts are available, with the option to add an extender module to increase the fader count or create a split-frame surface.

In total, the control surface can include any number of extenders as long as the maximum number of faders does not exceed 24.

Each frame connects to the Compact Engine via CAN bus, and is powered from its own 12V DC power supply (included). All frames include **CAN IN** and **CAN OUT** connectors for easy daisy-chaining. In each case, the CAN bus address of a module defines its functionality. Thus, frames can be wired in any order.

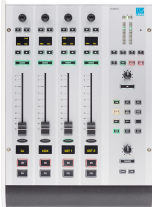
Split-frame Example



4.2.1 Frame Layouts

Five main frame layouts are available plus the 4-fader extender. Note that the 4-fader main frame supports a single Central Module, while all other sizes include two.

4-fader



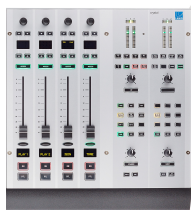
8-fader



12-fader



12-fader split



16-fader



4-fader extender



4.2.2 Placement Options

crystal is designed to be mounted on a table top surface.

All connectors are positioned along the top edge, so you must make sure that these are accessible:

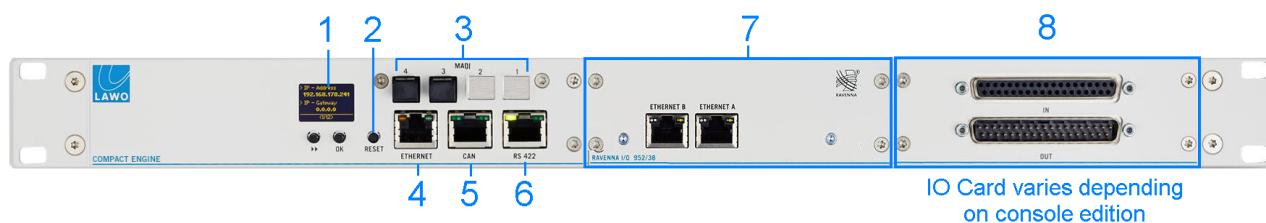
8-fader Surface (top edge)



4.3 The Compact Engine

The 19"/1RU Compact Engine contains the signal processing, control system and routing matrix. It also handles all audio, control and external Wordclock connections.

4.3.1 Front View



1 Status Display & Menu Control

The front panel display shows local device parameters such as the IP address. You can use the **>>** and **OK** buttons to navigate through the menus.

2 RESET button

Press this button to perform a warm start. The button is recessed to prevent accidental operation.

A warm start will reboot the device. Do *NOT* perform a warm start while live on air!

3 MADI 1 to 4

MADI ports 1 and 2 are not available for external use. They are used internally to support the RAVENNA card (7).

MADI ports 3 (and 4) can be used to connect multi-channel digital audio (1 x 64-channels). The two ports provide main and redundant connections: MADI 3 is the primary port and MADI 4 is the redundant port. The redundant connection is optional.

4 ETHERNET

The ETHERNET port connects other devices to the Compact Engine control system. In a crystal standard configuration system, it must connect to the host PC running the DisplayDock software.

5 CAN

The CAN bus port connects to the control surface frame.

6 RS 422

The serial port can be used for debugging, but is usually left unconnected.

7 Expansion Slot 1 - AoIP Streaming

Expansion slot 1 is fitted with a RAVENNA IO Card (952/38) to stream audio to and from an IP network.

By default, 32 stereo streams are transmitted and received via the ETHERNET A port, while ETHERNET B remains unused. The streams are fully compatible with AES67 and RAVENNA. Optionally, you can re-configure the two ports to support redundant streaming (via SPS).

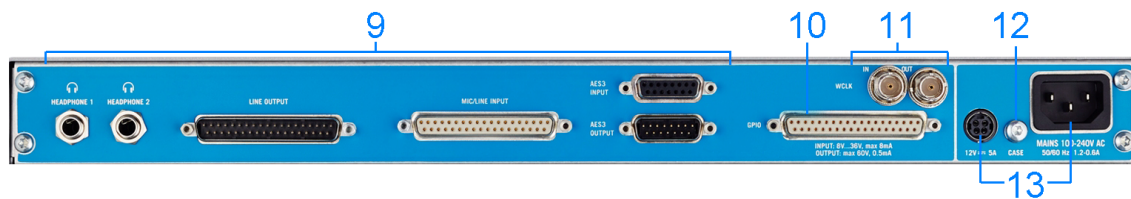
In both cases, the streaming network *must* be properly managed and configured.

8 Expansion Slot 2 - Digital or Analog IO

Expansion slot 2 is fitted with either more digital or more analog IO depending on the console edition:

- Fader Start: AES3 IO Card (952/32) - 4 x AES3 inputs and 4 x AES3 outputs.
- Button Start: LINE IO Card (952/31) - 8 x line level inputs and 8 x line level outputs.

4.3.2 Rear View



9 Analog & Digital IO

The following audio connections are always included.

- HEADPHONE 1 & HEADPHONE 2 - two stereo headphone outputs.
- LINE OUTPUT - 8 x line level outputs.
- MIC/LINE INPUT - 4 x mic/line in + 4 x line level in.
- AES3 INPUT - 4 x AES3 inputs.
- AES3 OUTPUT - 4 x AES3 outputs.

10 GPIO

This connector provides 8 x GPI (optocouplers) and 8 x GPO (silent and self-healing relays) for local signaling and switched functions.

11 WCLK IN & OUT

WCLK IN can be used to connect an external sync reference. The sync reference options are MADI, WCLK IN, AES3 or Internal.

WCLK OUT always provides an output of the current system reference.

12 CASE

The CASE grounding screw should be used to ground the frame.

13 12V DC & AC MAINS Inputs

Every device comes with dual power feeds: AC and DC. To use the DC input, you will need the external 12V DC power supply. This is optional and must be ordered separately.

If both inputs are connected, then the two feeds provide main and redundant power.

The Compact Engine *MUST* be connected to the mains using the power cable supplied with the system.

5. Specification

This chapter describes the system specification.

Topics include:

- [Available Sources](#)
- [Available Buses](#)
- [Default Audio Assignments](#)
- [GPIO Functions](#)

5.1 Available Sources

The tables below describe the available sources.

Note that the AES, LINE and HYBRID sources differ slightly between the Fader Start and Button Start editions.

All Editions

| Source Name | Format | Physical Input | | DSP Resources | | | |
|-----------------------|--------|--------------------|---|---------------|-----|-----|--------|
| | | Connector | Input No. / Stream Name | EQ | Dyn | Lim | DE/AMx |
| MIC 1 ...4 | mono | MIC/LINE INPUT | Input 1 ...4 | ✓ | ✓ | ✓ | ✓ |
| LINE 1 | stereo | " | Inputs 5&6 | ✓ | ✓ | ✓ | ✗ |
| EXT | stereo | " | Inputs 7&8 | ✗ | ✗ | ✗ | ✗ |
| RAVCO1 & 2 | stereo | ETHERNET A | RAV Codec 1 & 2 | ✓ | ✓ | ✓ | ✗ |
| RAVCO3 & 4 | stereo | " | RAV Codec 3 & 4 | ✗ | ✗ | ✗ | ✗ |
| RAV 01 ...03 | stereo | " | RAV In 1 ...3 | ✓ | ✓ | ✓ | ✗ |
| RAV 04 ...28 | stereo | " | RAV In 4 ...28 | ✗ | ✗ | ✗ | ✗ |
| MADI 01... MADI 32 | stereo | MADI ports 3 (& 4) | MADI channels 1&2... MADI channels 63&64 | ✗ | ✗ | ✗ | ✗ |

Fader Start (FS)

| Source Name | Format | Physical Input | | DSP Resources | | | |
|-------------|--------|--------------------|-------------------------|---------------|-----|-----|--------|
| | | Connector | Input No. / Stream Name | EQ | Dyn | Lim | DE/AMx |
| AES 1 ...2 | stereo | AES3 INPUT (rear) | Inputs 1&2 ...3&4 | ✓ | ✓ | ✓ | ✗ |
| AES 3 | stereo | " | Inputs 5&6 | ✗ | ✗ | ✗ | ✗ |
| AES CO | stereo | " | Inputs 7&8 | ✓ | ✓ | ✓ | ✗ |
| AES 4 ...6 | stereo | AES3 INPUT (front) | Inputs 1&2 ...5&6 | ✗ | ✗ | ✗ | ✗ |
| HYB 1 ...2 | mono | " | Input 7 ...8 | ✓ | ✓ | ✓ | ✗ |

Button Start (BT)

| Source Name | Format | Physical Input | | DSP Resources | | | |
|-------------|--------|--------------------|-------------------------|---------------|-----|-----|--------|
| | | Connector | Input No. / Stream Name | EQ | Dyn | Lim | DE/AMx |
| AES 1 | stereo | AES3 INPUT (rear) | Inputs 1&2 | ✓ | ✓ | ✓ | ✗ |
| AES 2 ...3 | stereo | " | Inputs 3&4 ...5&6 | ✗ | ✗ | ✗ | ✗ |
| AES CO | stereo | " | Inputs 7&8 | ✓ | ✓ | ✓ | ✗ |
| LINE 2 | mono | LINE INPUT (front) | Inputs 1&2 | ✓ | ✓ | ✓ | ✗ |
| LINE 3 ...4 | mono | " | Inputs 3&4 ...5&6 | ✗ | ✗ | ✗ | ✗ |
| HYB 1 ...2 | mono | " | Input 7 ...8 | ✓ | ✓ | ✓ | ✗ |

5.2 Available Buses

The tables below describes the available summing and N-1 buses.

Note that the pre-fade listen bus is called PFL on Fader Start consoles and CUE on Button Start consoles.

| Summing Bus Name | Format | Pickup Point | Outputs |
|------------------|--------|-------------------|---|
| PGM 1 | stereo | post-fader | see Default Audio . |
| PGM 2 | stereo | " | " |
| PGM 3 | stereo | " | " |
| AUX 1 | stereo | pre or post-fader | " |
| AUX 2 | stereo | " | " |
| PFL / CUE | stereo | pre-fader | PFL/CUE appears on the MON CR and MON DJ outputs. |

| N-1 Bus Name | Format | Pickup Point | Outputs |
|--------------|--------|----------------------------|-------------------------------------|
| HYB 1 | mono | post-fader N-1 (mix minus) | see Default Audio . |
| HYB 2 | mono | " | " |
| RAV CODEC 1 | mono | " | " |
| RAV CODEC 2 | mono | " | " |
| RAV CODEC 3 | mono | " | " |
| RAV CODEC 4 | mono | " | " |
| AES CODEC | mono | " | " |

5.3 Default Audio Assignments

The tables which follow list the default audio assignments for the inputs and outputs.

For the inputs, the source assignments are fixed and cannot be changed by the user. Instead, you can choose which inputs are active in the mix by changing the fader strip [assignments](#) on the surface.

For the outputs, the configuration loads the default audio assignments. These can be modified from the [local matrix](#) (in DisplayDock).

5.3.1 Analog Inputs

| MIC/LINE INPUT (Compact Engine rear panel) | | |
|--|-------------|------------|
| Input Number | Source Name | Format |
| 1 | MIC 1 | mono |
| 2 | MIC 2 | mono |
| 3 | MIC 3 | mono |
| 4 | MIC 4 | mono |
| 5/6 | LINE 1 | left/right |
| 7/8 | EXT | left/right |

Button Start Consoles only

| LINE INPUT (Compact Engine front expansion slot 2) | | |
|--|-------------|------------|
| Input Number | Source Name | Format |
| 1/2 | LINE 2 | left/right |
| 3/4 | LINE 3 | left/right |
| 5/6 | LINE 4 | left/right |
| 7 | HYB 1 | mono |
| 8 | HYB 2 | mono |

5.3.2 Analog Outputs

| LINE OUTPUT (Compact Engine rear panel) | | | |
|---|-------------------|------------|--------------------|
| Output Number | Local Matrix Name | Format | Default Audio from |
| 1/2 | LINE 1 | left/right | PGM 1 |
| 3/4 | LINE 2 | left/right | HYB1 / HYB2 |
| 5/6 | LINE 3 | left/right | MON STUDIO |
| 7/8 | LINE 4 | left/right | MON CR |

| HEADPHONE SOCKETS (Compact Engine rear panel) | | | |
|---|-------------------|------------|--------------------|
| Output Number | Local Matrix Name | Format | Default Audio from |
| HEADPHONE 1 | HP 1 | left/right | MON DJ |
| HEADPHONE 2 | HP 2 | left/right | MON GUEST |

Button Start Consoles only

| LINE OUTPUT (Compact Engine front expansion slot 2) | | | |
|---|-------------------|------------|--------------------|
| Output Number | Local Matrix Name | Format | Default Audio from |
| 1/2 | LINE 5 | left/right | AUX 1 |
| 3/4 | LINE 6 | left/right | AUX 2 |
| 5/6 | LINE 7 | left/right | - |
| 7/8 | LINE 8 | left/right | - |

5.3.3 Digital Inputs

| AES3 INPUT (Compact Engine rear panel) | | |
|--|-------------|------------|
| Input Number | Source Name | Format |
| 1/2 | AES 1 | left/right |
| 3/4 | AES 2 | left/right |
| 5/6 | AES 3 | left/right |
| 7/8 | AES CODEC | left/right |

Fader Start Consoles only

| AES3 INPUT (Compact Engine front expansion slot 2) | | |
|--|-------------|------------|
| Input Number | Source Name | Format |
| 1/2 | AES 4 | left/right |
| 3/4 | AES 5 | left/right |
| 5/6 | AES 6 | left/right |
| 7 | HYB 1 | mono |
| 8 | HYB 2 | mono |

5.3.4 Digital Outputs

| AES3 OUTPUT (Compact Engine rear panel) | | | |
|---|-------------------|------------|--------------------|
| Output Number | Local Matrix Name | Format | Default Audio from |
| 1/2 | AES 1 | left/right | PGM 1 |
| 3/4 | AES 2 | left/right | PGM 2 |
| 5/6 | AES 3 | left/right | PGM 3 |
| 7/8 | AES 4 | left/right | AES CODEC |

Fader Start Consoles only

| AES3 OUTPUT (Compact Engine front expansion slot 2) | | | |
|---|-------------------|------------|--------------------|
| Output Number | Local Matrix Name | Format | Default Audio from |
| 1/2 | AES 5 | left/right | AUX 1 |
| 3/4 | AES 6 | left/right | AUX 2 |
| 5/6 | AES 7 | left/right | - |
| 7/8 | AES 8 | left/right | - |

5.3.5 RAVENNA Inputs

| ETHERNET A (streaming port ra0) | | | |
|---------------------------------|-----------------------|-----------------|------------|
| RAVENNA Input Number | Rx Stream Name | Source Name | Format |
| 1/2 | RAV Codec 1 | R COD1 | left/right |
| 3/4 | RAV Codec 2 | R COD2 | left/right |
| 5/6 | RAV Codec 3 | R COD3 | left/right |
| 7/8 | RAV Codec 4 | R COD4 | left/right |
| 9/10... 63/64 | RAV In 1... RAV In 28 | RAV 1... RAV 28 | left/right |

5.3.6 RAVENNA Outputs

| ETHERNET A (streaming port ra0) | | | |
|---------------------------------|---|------------|--------------------|
| RAVENNA Output Number | Tx Stream Name | Format | Default Audio from |
| 1/2 | RAV PGM 1 | left/right | PGM 1 |
| 3/4 | RAV PGM 2 | left/right | PGM 2 |
| 5/6 | RAV PGM 3 | left/right | PGM 3 |
| 7/8 | RAV PGM 4 | left/right | AUX 1 |
| 9/10 | RAV AUX 1 | left/right | AUX 2 |
| 11 | RAV CODEC 1 | mono | RAV CODEC N-1 |
| 12 | RAV CODEC TB | mono | RAV CODEC TB |
| 13 | RAV CODEC 2 | mono | RAV CODEC N-1 |
| 14 | RAV CODEC 2 TB | mono | RAV CODEC TB |
| 15 | RAV CODEC 3 | mono | RAV CODEC N-1 |
| 16 | RAV CODEC 3 TB | mono | RAV CODEC TB |
| 17 | RAV CODEC 4 | mono | RAV CODEC N-1 |
| 18 | RAV CODEC 4 TB | mono | RAV CODEC TB |
| 19... 64 | additional Tx streams must be created using the RAVENNA Web UI. | | |

5.3.7 MADI Inputs

| MADI 3 & 4 (Compact Engine front panel) | | |
|---|-------------------|------------|
| Channel Number | Source Name | Format |
| 1/2... 63/64 | MADI 1... MADI 32 | left/right |

5.3.8 MADI Outputs

| MADI 3 & 4 (Compact Engine front panel) | | |
|---|------------|--------------------|
| Channel Number | Format | Default Audio from |
| 1/2... 63/64 | left/right | |

5.4 GPIO Functions

The tables below describe the functionality provided by the GPIO connector.

8 x GPI (opto-couplers) and 8 x GPO (silent CMOS relays) are supported.

| GPI | Function Name | Logic |
|-----|------------------------|--|
| 1 | MIC 2 ON / OFF / COUGH | ON / OFF toggle; if ON and "push and hold" (400 ms) > mute |
| 2 | MIC 3 ON / OFF / COUGH | ON / OFF toggle; if ON and "push and hold" (400 ms) > mute |
| 3 | MIC 4 ON / OFF / COUGH | ON / OFF toggle; if ON and "push and hold" (400 ms) > mute |
| 4 | MIC 2 TALK | INPUT MUTE MIC; > DJ HP and CR |
| 5 | MIC 3 TALK | INPUT MUTE MIC; > DJ HP and CR |
| 6 | MIC 4 TALK | INPUT MUTE MIC; > DJ HP and CR |
| 7 | INCOMING CALL HYB 1 | HYBRID 1 (LOCAL) |
| 8 | INCOMING CALL HYB 2 | HYBRID 2 (LOCAL) |

| GPO | Function Name | Logic |
|-----|--------------------|------------------|
| 1 | REDLIGHT CR | |
| 2 | REDLIGHT STUDIO | |
| 3 | FADER START LINE 1 | |
| 4 | FADER START AES 1 | |
| 5 | HYBRID 1 ON | HYBRID 1 (LOCAL) |
| 6 | HYBRID 2 ON | HYBRID 2 (LOCAL) |
| 7 | PGM 1 SILENCE | |
| 8 | MIC 1 "ON" TALLY | |

6. Installation

This chapter describes how to install the control surface and Compact Engine.

Topics include:

- [Installing the Control Surface](#)
- [Installing the Compact Engine](#)
- [Grounding & Power](#)
- [Wiring](#)
- [Synchronization](#)

6.1 Installing the Control Surface

6.1.1 Packing List

Each control surface frame ships with the following accessories:

- 1 x external 12V DC power supply with 1 x 2m IEC power cable (country-specific) - to connect 12V DC power.
- 1 x 3m CAT5e cable - to connect the CAN bus to the Compact Engine.

If you have ordered an extender module, then you will receive one set of accessories per module.

6.1.2 Preparation

Unpacking

Each control surface frame is delivered in its own box with all included accessories.

Please check the contents of the shipping boxes, and in the event of any transport damage, contact your local Lawo representative or email support@lawo.com. A list of serial numbers for all components is included with the shipment. Please keep this list for your records.

Dimensions and Weight

| | 4-fader frame (952/41) | 8-fader frame (952/42) | 12-fader frame (952/43) | 12-fader split-frame (952/44) | 16-fader frame (952/45) |
|--------------------|---------------------------|---------------------------|----------------------------|------------------------------------|----------------------------|
| Width | 289 mm | 561 mm | 751 mm | 4-fader: 371mm 8-fader: 397mm | 942 mm |
| Depth | 395mm | | | | |
| Height | 35mm | | | | |
| Height (inc knobs) | 51 mm | | | | |
| Weight | 3.1 Kg | 5.9 Kg | 8.0 Kg | 4-fader: 3.9 Kg 8-fader: 4.7 Kg | 10 Kg |

Temperature and Cooling

The control surface is designed for normal studio installation and needs no special air conditioning.

Power Consumption & Electrical Voltage

Please see the [12V DC Power Supply](#) appendix.

6.2 Installing the Compact Engine

6.2.1 Packing List

Included

The Compact Engine ships with the following accessories:

- 1 x 2m IEC power cable (country-specific) - to connect AC mains to the frame.
- 1 x serial cable (485-0700-000) - to connect to the RS 422 port (for diagnostics).
- Dust caps for the MADI connectors - these will be mounted in the frame.
- 1 x USB memory card - containing marketing materials.

Optional

The following accessories can be ordered separately:

- 1 x external 12V DC power supply (955/50-80) - to connect 12V DC power to the frame.

6.2.2 Preparation

Unpacking

The Compact Engine is delivered in its own box with all included accessories. If you have ordered a 12V DC power supply, then this will be delivered separately.

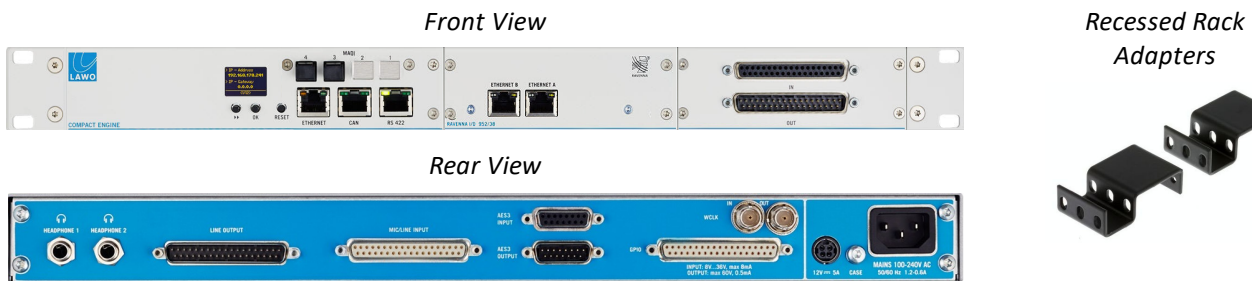
Please check the contents of the shipping boxes, and in the event of any transport damage, contact your local Lawo representative or email support@lawo.com. A list of serial numbers for all components is included with the shipment. Please keep this list for your records.

Rack-Mounting

The Compact Engine can be mounted either in a 19-inch equipment rack or on a table top.

For table-top mounting, the unit should be laid on a flat, horizontal surface.

For rack-mounting, please install supporting slide bars to hold the weight of the unit. Please check that airflow through the device is still possible, and use the locking devices provided. For recessed rack-mounting, use standard, third-party, 1RU recessed rack adapters such as the ones shown below. When fitting the rack adapters and slide bars, you must make sure that there is sufficient airflow through the device for cooling.



Connectors are located at the front and rear of the unit. Therefore, when using 19-inch racks with doors please leave enough room for the cables.

Dimensions and Weight

| | |
|---|----------------|
| Width | 19" / 482.6 mm |
| Height (enclosure only) | 44.0 mm (1 RU) |
| Height (overall, incl. pads) | 46.5 mm |
| Depth (inc locking devices) | 414 mm |
| Weight of frame (without expansion cards) | 3.0 Kg |

Temperature and Cooling

The Compact Engine is equipped with two fans inside. Ventilation holes are provided on the left and right. There must be sufficient airflow around the device for cooling.

DO NOT obstruct the side ventilation holes as to do so will prevent efficient cooling.

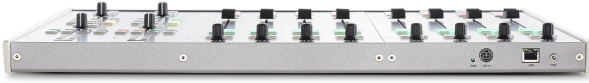
Proper operation is guaranteed between temperatures of 10° C and 35° C and a maximum relative humidity of 85%.

Power Consumption & Electrical Voltage

Please refer to the Compact Engine [data sheet](#) for details on power consumption and electrical voltage.

6.3 Grounding & Power

8-fader crystal surface (top edge)



Compact Engine (rear view)



6.3.1 Grounding

Although operator protection is guaranteed, it is best to establish an additional ground for EMC reasons.

On the Compact Engine, a grounding screw is provided beside the **DC IN** connector on the rear of the frame. On the control surface, a grounding screw is provided beside the **CAN** bus connector.

In each case:

1. Use the M4x8 **CASE** screw to fasten the grounding cable to the housing.

The Compact Engine and Control Surface must be on the same potential as all other system devices. For Scandinavian countries, ALWAYS use a grounded mains connection, to prevent the device from being grounded through Ethernet or other signal connections.

Grounding of Audio Interfaces

For compliance with AES3, digital interfaces should be connected to a field ground.

For microphones, the ground from the device should connect directly to the microphone via the cable shielding, otherwise phantom power cannot be transferred. Take care that the shielding does not connect to the field ground, to prevent interference and loss of signal quality.

6.3.2 Control Surface Power

The control surface comes with a single power feed: DC.

It is powered by its own external 12V DC power supply. For dimensions, weight and electrical specification, please see the [crystal Surface Power Supply](#) appendix.

➤ To connect DC power to the surface:

1. Connect the 12V DC power supply to the **DC IN** connector on the rear panel.
2. Using the IEC cable provided, connect your AC mains to the PSU.

The AC mains connection *MUST* be made using the power cable supplied with the system.

6.3.3 Compact Engine Power

The Compact Engine comes with dual power feeds: AC and DC.

To use the DC input, you will need the external 12V DC power supply (955/50-80). This is optional and must be ordered separately. For dimensions, weight and electrical specification, please see the [Compact Engine Power Supply](#) appendix.

If both inputs are connected, then the two feeds provide main and redundant power.

- To connect AC power to the frame:
 1. Using the IEC cable provided, connect your mains to the **100-240V** AC input on the rear panel.
- To connect DC power to the frame (optional):
 1. Connect the 12V DC power supply to the **DC IN** connector on the rear panel.
 2. Using the IEC cable provided, connect your AC mains to the PSU.

The Compact Engine *MUST* be connected to the mains using the power cable supplied with the system.

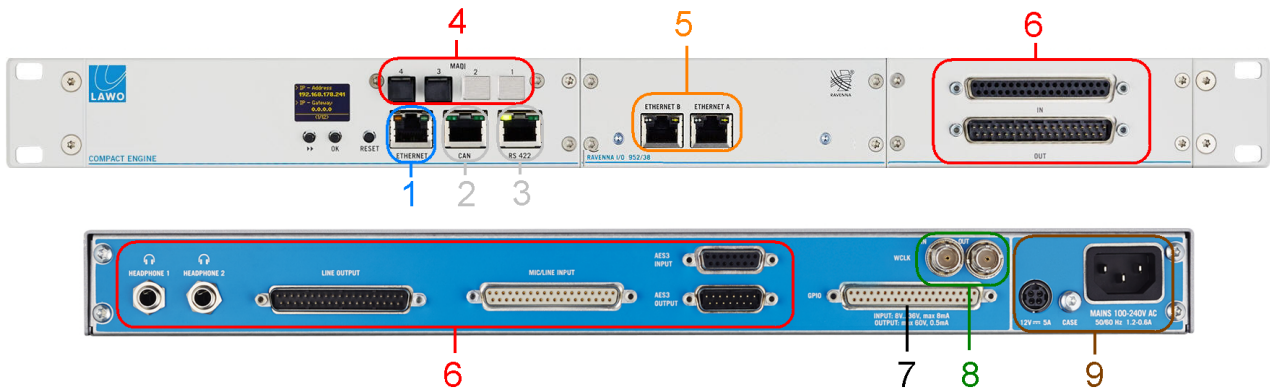
6.4 Wiring

The system should be wired from the Compact Engine as follows. Please see [Connector Pin-Outs](#) for pinning information.

For the initial setup, only ETHERNET (1), CAN (2) and Power (9) are required.

For the audio and GPIO connections, the functionality is defined by the configuration. Therefore, before wiring these connectors, please refer to the [Default Audio Assignments](#) and [GPIO Functions](#).

Compact Engine (front and rear)



1 ETHERNET (CAT 5e or better)

The ETHERNET port provides a network connection to the Compact Engine control system. It should connect to the control PC running the DisplayDock software.

The connection can be made either directly or via a network switch. When connecting via a network, then this can be shared with other devices, such as in the regular "house network" of a typical broadcast facility. Routers are permitted as long as the minimum requirements below are met. By using routers, or similar devices, the latency of the communication will increase. The control network *MUST* meet or exceed the following requirements:

- At least 100MBit/s; 1 GBit/s preferred
- Full Duplex

It is important to keep the control network separate from the streaming network connected to the AoIP ports (5).

For a direct connection, you will need a crossover network cable. For connection via a network switch, use a straight (1:1) network cable. The cable should be STP-CAT 5e or better with RJ45 connectors.

To establish communication, you will need to configure the network settings on the control PC.

2 CAN (CAT 5e)

The CAN port connects the Compact Engine to the control surface (via CAN bus).

For a stand-alone surface, use a single point-to-point connection. If the surface has an extender, then you will need to daisy-chain the CAN Bus (as described [later](#)).

All CAN bus connections must be point-to-point; a switch or hub is not allowed. Use a standard (straight 1:1) network cable: STP-CAT 5e with RJ45 connectors.

The CAN bus can be hot-plugged, and so the cabling can be performed while the components are powered.

The maximum length of the CAN bus connection is 60 meters.

3 RS-422 (serial)

The serial port is usually left unconnected.

4 MADI (optical)

In the crystal standard configuration, MADI ports 1 and 2 are not available for external use. They are used internally to support the RAVENNA IO card (5).

MADI ports 3 (and 4) can be used to connect multi-channel digital audio to the system. The ports conform to AES10 and carry 64 bi-directional channels (at 48kHz).

The two ports operate as a main and redundant connection: MADI 3 is the primary port and MADI 4 is the redundant port. On the input side, the system will switch automatically to the redundant port if the primary port fails. On the output side, the two ports carry duplicate signals. If redundancy is not required, then it is recommended to connect your device to port 3 and leave port 4 unconnected.

All MADI connections must be point-to-point. The maximum connection length depends on the fibre type. The connectors are MT-RJ.

Internally, the 64 MADI channels are configured for stereo operation within the available sources [list](#) and local [matrix](#). This is important to remember when assigning audio onto the 64 mono channels in the connecting device. For example, the stereo source "MADI 2" will use the audio arriving on channels 3&4; the stereo output named "MADI 3" will send audio out on channels 5&6; and so on.

5 AoIP Streaming (CAT 5/6/7)

Expansion slot 1 is fitted with a RAVENNA IO Card (952/38) to stream audio to and from an IP network.

By default, 32 stereo streams are transmitted and received via the ETHERNET A port, while ETHERNET B remains unused. The streams are fully compatible with the SMPTE ST2110-30/31, AES67 and RAVENNA standards. Optionally, you can use both interfaces (A and B) to support redundant streaming via SMPTE ST2022-7, Seamless Protection Switching. This requires some modification of the streaming configuration and a supporting network infrastructure.

The connection(s) *must* be made via a network switch and *not* directly to another streaming port. Use a straight (1:1) STP-CAT 5 network cable with RJ45 connectors. You can find more details about the data network requirements and suitable components in the [Lawo IP Networking Guide](#).

The streaming network *must* be properly configured and managed. i.e. it must use a suitable network architecture; all components must support multicast (as opposed to unicast); a proper Quality of Service (QoS) must be configured; and so on.

Please *DO NOT* attempt to connect the streaming ports using an unqualifying IP network, as correct operation cannot be guaranteed.

Internally, the first four Rx streams are reserved for stereo codecs, and the next 28 Rx streams for other stereo sources. They are named RAV CODEC 1 to 4 and RAV 1 to 28 in the available sources [list](#). A number of Tx streams are also pre-defined; their default audio assignments are listed in the [Specification](#) chapter.

See [Setting Up RAVENNA/AES67](#) for details on how to set up the Rx and Tx streams.

6 ANALOG & AES3 IO

The following can be used to connect your other audio devices.

Rear Panel:

- **HEADPHONE 1 & HEADPHONE 2** (6.35mm stereo jacks) - 2 x stereo headphone outputs.
- **LINE OUTPUT** (37-pin D-Sub male) - 8 x line level outputs.
- **MIC/LINE INPUT** (37-pin D-Sub female) - 4 x mic/line level inputs and 4 x line level inputs.
- **AES3 INPUT** (15-pin D-Sub female) - 4 x AES3 inputs.
- **AES3 OUTPUT** (15-pin D-Sub male) - 4 x AES3 outputs.

Front Panel (Fader Start edition):

- **AES3 INPUT** (15-pin D-Sub female) - 4 x AES3 inputs.
- **AES3 OUTPUT** (15-pin D-Sub male) - 4 x AES3 outputs.

Front Panel (Button Start edition):

- **LINE IN** (37-pin D-Sub female) - 8 x line level inputs.
- **LINE OUT** (37-pin D-Sub male) - 8 x line level outputs.

All LINE IN and LINE OUT connections are electronically balanced. For LINE OUTs, the maximum analog level can be adjusted to +12, +15, +18, +21 or +24 dBu relative to digital full scale (dBFS). This is a factory-configured setting; +24dBu is recommended.

Each of the 4 MIC/LINE INs features a discrete class-A preamplifier with superb performance at both low (mic) and high (line) levels. In addition to variable microphone pre-amp gain, each input comes with switchable 48V phantom power, a high-pass filter and 20dB PAD. The pre-amp gain can be automatically adjusted using the [AutoGain](#) feature. The maximum analog input level (with the PAD enabled) is +24dBu.

All AES INPUTs and OUTPUTs conform to the stereo AES3 standard. The four AES INs have sample rate conversion (SRC).

7 GPIO (37-pin D-Sub)

The GPIO connector provides 8 x GPI (optocouplers) and 8 x GPO (silent relays) for local signaling and switched functions:

- GPI = 8 x optocouplers (3-36V DC / 8mA @ 36V)
- GPO = 8 x Opto-MOS relays (60V AC / 0.5A @ 60V)

The connector is a 37-pin D-type.

8 WCLK IN & OUT (BNC)

The system can sync to external wordclock by connecting the clock signal to **WCLK IN**.

The **WCLK OUT** provides an output of the current system reference: WCLK IN, AES or internal clock.

In both cases, connections are made using standard 75 ohm BNC connectors. The maximum cable length depends on the equipment you are connecting to.

See [Synchronization](#) for more details.

9 Grounding & Power

See [Grounding & Power](#).

6.5 Synchronization

Sync Reference Options

The available sync reference options are:

- **MADI** - connected to the active **MADI** port: either MADI 3 or 4 on the Compact Engine front panel.
- **Wordclock** – connected to the **WCLK IN** on the Compact Engine rear panel.
- **AES** – connected to the **AES3 INPUT** on the Compact Engine rear panel.
- **Internal Clock** – set to either 48kHz or 44.1kHz.

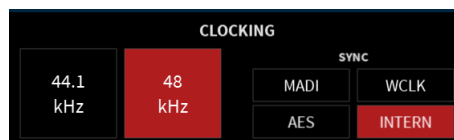
All options are always enabled and so the system will use the highest prioritized sync source (if a valid signal is present): MADI, Wordclock, AES3 or internal clock. The switching between external sync and internal clock is handled automatically.

If external sync is not available, then the Compact Engine can act as a sync master and distribute its internal clock to other devices (via WCLK OUT).

The internal clock generator defaults to 48kHz, but this can be changed to 44.1kHz from the DisplayDock GUI (as described below).

Checking the Sync Reference

The available and active sync sources can be checked from the DisplayDock [Advanced](#) page (in the "CLOCKING" area):



The "SYNC" fields are indicators only; you cannot change the sync source from the GUI: red = active; blue = available. In our example, the active sync source is **INTERNAL**.

Changing the Sample Rate

The sample rate of the internal clock generator can be changed from **48kHz** to **44.1kHz**, or vice versa, when all faders are closed (off-air) and UNLOCK (on the Central Module) is pressed.

Note that this operation is only possible when all faders are closed (as the change would be audible if it was permitted while on-air). In this instance, the button colors update to red = active and blue = inactive but available. Select the inactive (blue) option to make the change.

After a cold start, the internal generator will reset to the default value stored in the configuration (48kHz).

Sync Output

The WCLK OUT connector always provides an output of the current system reference.

7. System Setup

This chapter describes how to install the software and set up the system.

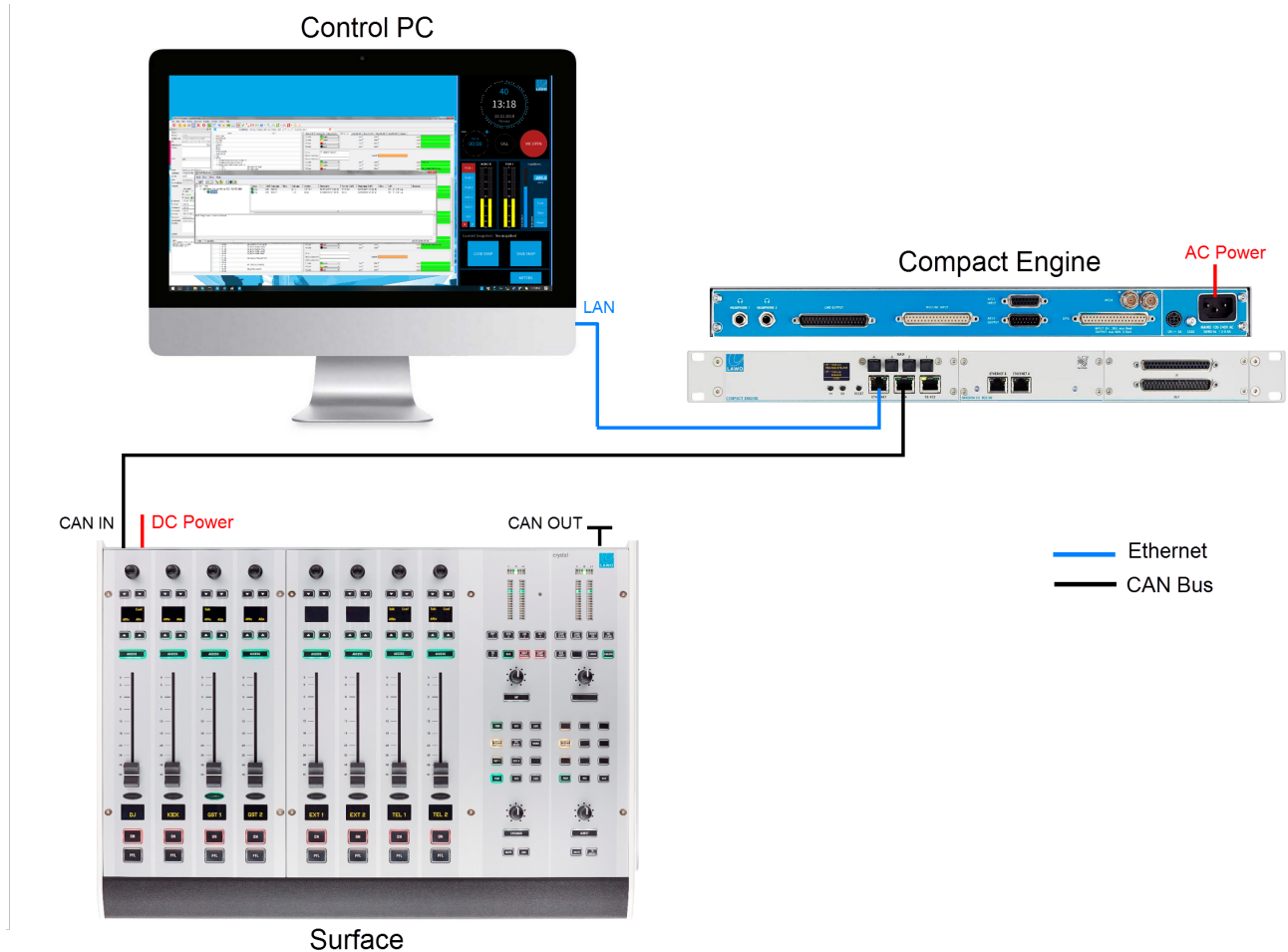
Topics include:

- [System Connections \(Required for Setup\)](#)
- [Powering On & Checking the System](#)
- [Setting Up the Control PC](#)
- [Configuring the System](#)
- [Licensing](#)
- [Editing the System IP Settings](#)
- [Setting the System Date and Time](#)
- [Setting the Time Zone](#)
- [Setting Up RAVENNA/AES67](#)

7.1 System Connections (Required for Setup)

In order to boot and configure the system, the following connections must be made: CAN bus (to the control surface), ETHERNET (to the control PC) and power to all devices. The CAN and ETHERNET connections can be hot-plugged, and so the cabling can be performed in any order.

The system ships with the required CAN bus and ETHERNET cables, 12V DC power supply (for the surface) and IEC cables to connect the AC mains.



1. Start by connecting the Compact Engine **CAN** port to the control surface **CAN IN**.

The connection *must* be point-to-point; a switch or hub is not allowed. If more than one frame is supplied, then the CAN bus must be daisy-chained. On the last surface in the chain, fit the CAN bus terminator (supplied with the system) to the **CAN OUT**.

2. Next, connect the PC's **LAN** port *directly* to the Compact Engine **ETHERNET** port.

To set up the system, you should make a direct connection (as shown above). This can be modified later to connect via a network.

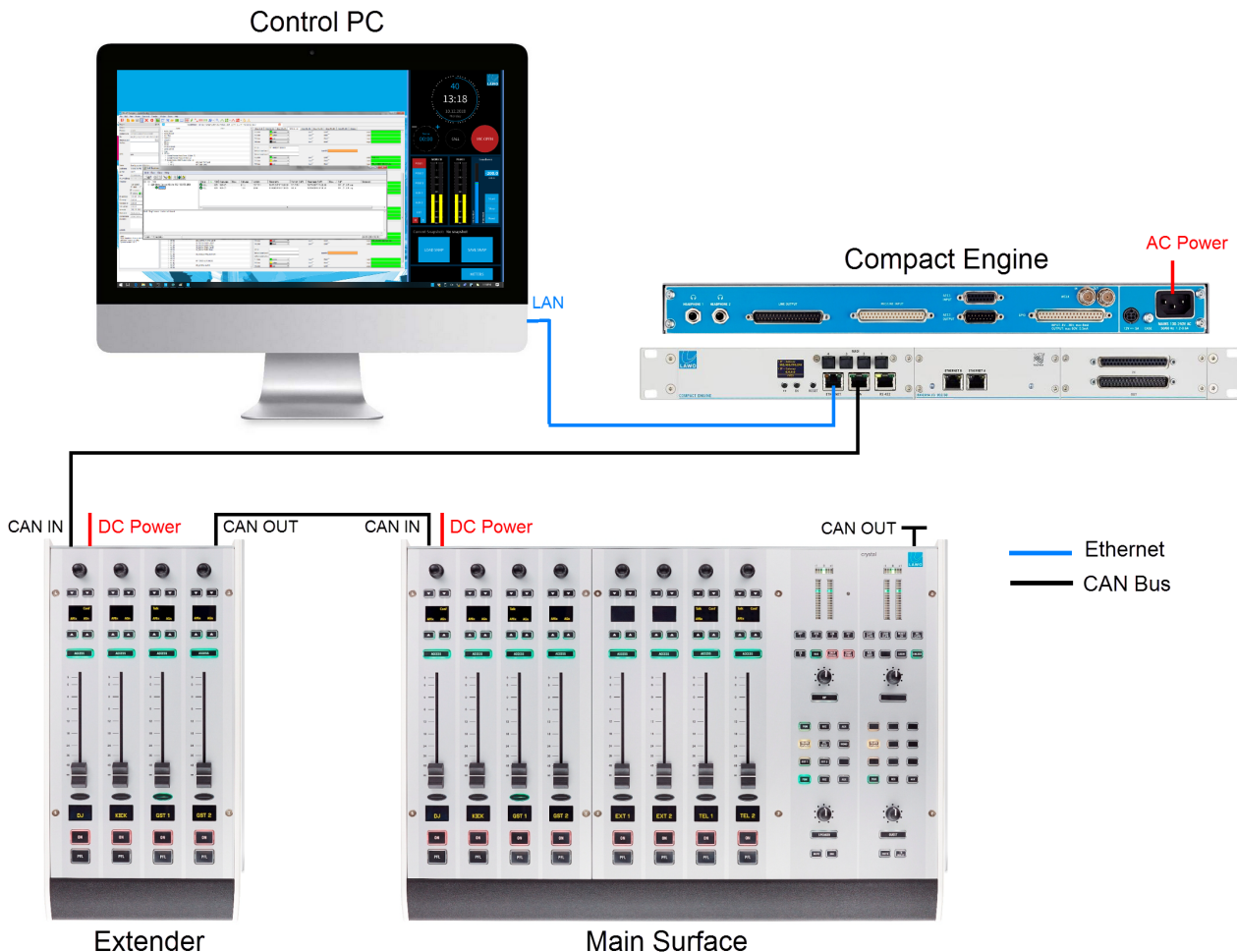
Take care to use the **ETHERNET** port and *not* either of the RAVENNA ports.

3. Connect the 12V DC power supply to the **DC IN** connector on the control surface. Then, using the IEC cable provided, connect your AC mains to the DC power supply.
4. Using the IEC cable provided, connect the mains supply to the **100-240V** AC input on the Compact Engine.

The AC mains connections *MUST* be made using the power cables supplied with the system.

7.1.1 Connecting an Extender Module

If you are adding an extender module to the surface, then the CAN bus must be daisy-chained.



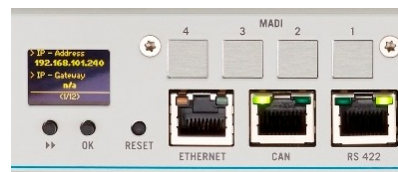
In this instance:

1. Connect the Compact Engine **CAN** port to the extender module **CAN IN**.
2. Then connect the extender module **CAN OUT** to the **CAN IN** on the main surface.
3. Fit the CAN bus terminator (supplied with the system) to the **CAN OUT** on the main surface.
4. Remember to connect power to both the main surface and extender module (using the PSU's provided).

The CAN bus must be terminated and so it is important to connect the full chain. Please do not attempt to operate the system with only an extender module connected!

7.2 Powering On & Checking the System

Compact Engine (front view)



The control surface and Compact Engine have no on/off switch but start automatically when power is applied. The components can be powered in any order.

Let's assume that you turn on both devices:

- You will see an initial flicker of LEDs on the control surface modules.
- On the Compact Engine, you will see the boot-up progress on the front panel display.
- As soon as boot-up is complete, the display shows the device's IP address, and the system run LED (to the right of the RS422 connector) begins to flash at regular intervals.

If the system run LED does not start to blink, then the Compact Engine has an internal problem. Please try a [restart](#) as a first step.

At the end of the boot-up, the system loads the state of all settings at the last shut down (known as the warm start data). This means that when you turn on, you will get back to wherever you were at the last power off.

The hardware components are now ready to be configured - this takes approximately 20 seconds from power on.

Please note: if you perform a cold start, then the system ignores the warm start data and resets to the default values stored in the configuration.

7.3 Setting Up the Control PC

7.3.1 PC Requirements

The control PC must meet the minimum system requirements for VisTool MK2. Please double-click [here](#) to view the requirements (as a pdf).

7.3.2 Configuring the Network Settings on the PC

To establish a network connection to the Compact Engine, you will need to configure the network settings for the PC's LAN port. The exact steps vary depending on your OS version.

The IP Address must be unique, and set within the same range as that of the Compact Engine's ETHERNET port. The Subnet Masks should be identical.

You can check the current network settings from the Compact Engine's front panel display. The defaults are:

- **IP Address** = 192.168.101.240
- **Subnet Mask** = 255.255.255.0
- **Gateway** = 0.0.0.0

Test the connection by opening a web browser application and typing in the default IP address = **192.168.101.240**. If the connection is successful, then the Web UI home page will appear.

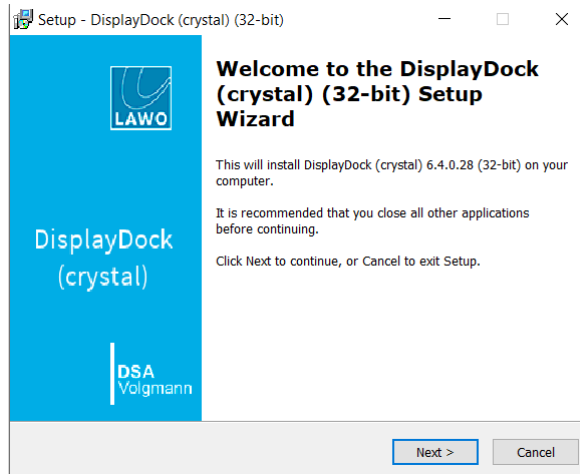
If there is a problem opening the page, then first check your web browser (see Web UI for the browser requirements). Then check the network cabling and IP settings of the control PC and Compact Engine.

If you are connecting via a larger network, you may need to consult your network administrator to gain access to the Lawo device.

7.3.3 Installing the Software

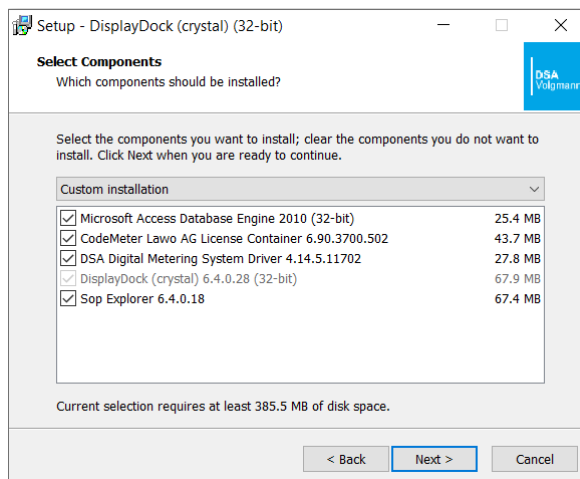
The latest version of the **displaydock_crystal.exe** installer is available from the **Downloads** area at www.lawo.com (after **Login**).

1. Copy the installer onto your control PC.
2. Double click on the installer icon - this starts the 'DisplayDock Setup Wizard':



3. Follow the Wizard's instructions accepting the default options provided.

At the 'Select Components' window, please accept all default options to install or update the components:

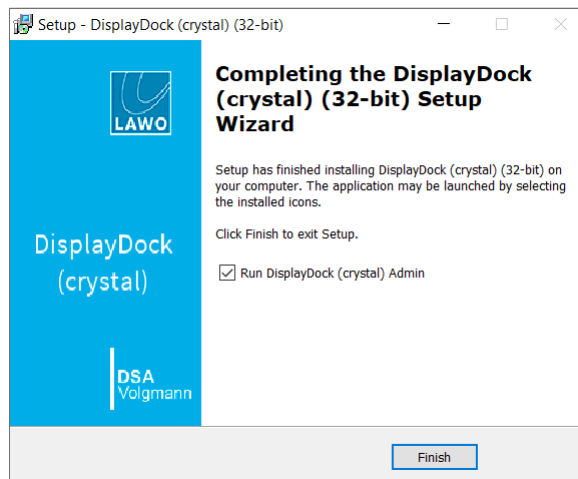


Note that the **CodeMeter Runtime** software is necessary for licensing. If it is already installed, then you can deselect this option and use an existing Cm container for the license storage. Or, keep the option selected to update the CodeMeter release and create a new Cm container.

4. When you reach the 'Summary' window, check the options and click **Install** - the software components are installed onto your computer; this may take a few minutes.

By default, files are installed in the location: 'C:\Program Files\DisplayDock (Crystal)'.

5. When all of the components have been installed, the following window will appear:



Select **Finish** to exit the setup wizard and launch the **DisplayDock Admin** tool.

If you have any problems with the software installation, please contact your local Lawo representative or email support@lawo.com.

7.4 Configuring the System

DisplayDock Admin is the administrative program which configures the system. It is used for four main tasks:

- To check and update the system firmware.
- To update or change the configuration from Fader Start to Button Start.
- To check and update the firmware on the RAVENNA IO Card.
- To select the monitor used by DisplayDock (to launch the GUI).

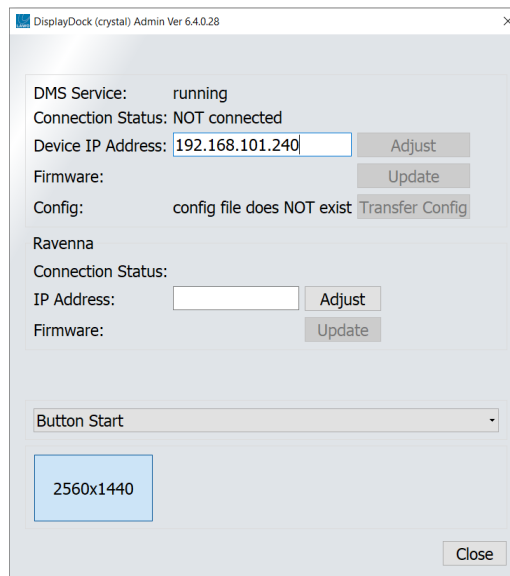
You will need to run DisplayDock Admin whenever you update to a new version of software. The latest firmware and configuration files copied onto the control PC during the software installation. When DisplayDock Admin connects to the Compact Engine, it compares the versions and updates the status messages accordingly. Any new files can then be transferred.

7.4.1 Opening a Connection to the Compact Engine

1. DisplayDock Admin starts automatically at the end of the software installation procedure.

Alternatively, select **Program Files -> DisplayDock (Crystal) -> DisplayDock (Crystal) Admin** from the Windows START menu.

The "DMS Service" should be **running** and the "Connection Status" will show either **connected** (if there is a valid network connection) or **NOT connected** (if there is no network connection):



2. To establish a connection, enter the IP Address of your Compact Engine into the "Device IP Address" field, and select **Adjust**.

You can check the current network settings from the Compact Engine's front panel display. The default IP Address = 192.168.101.240

If the "Connection Status" remains as **NOT connected**, then there is a problem with the network communication. Check that the "Device IP Address" has been entered correctly. Then check the physical connections and the TCP/IP settings of your computer's Network Interface Card.

- Once a valid network connection is detected, the program begins checking the "Firmware" and "Config" status of the device - this may take a few seconds.

If either component has a new version, then start by updating the firmware and then transferring the configuration. You should perform both of these tasks *before* [updating](#) the RAVENNA IO card.

Checking Firmware

| | | |
|--------------------|-----------------|--|
| DMS Service: | running | |
| Connection Status: | ... | |
| Device IP Address: | 192.168.101.240 | <input type="button" value="Adjust"/> |
| Firmware: | checking... | <input type="button" value="Update"/> |
| Config: | | <input type="button" value="Transfer Config"/> |

Firmware Up to Date

| | | |
|--------------------|----------------------|--|
| DMS Service: | running | |
| Connection Status: | connected | |
| Device IP Address: | 192.168.101.240 | <input type="button" value="Adjust"/> |
| Firmware: | up to date | <input type="button" value="Update"/> |
| Config: | config is up to date | <input type="button" value="Transfer Config"/> |

7.4.2 Updating the Firmware

If a new "Firmware" version is **available**, then update the Compact Engine as follows.

- Click on **Update** to start the update procedure.

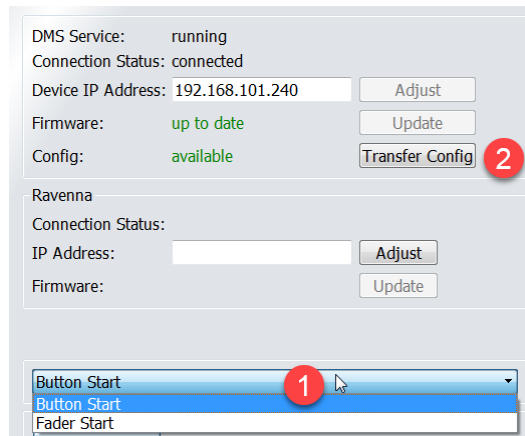
The "Firmware" status message shows **update in progress** while the necessary data is transferred. This may take a while.

- Following the transfer, the Compact Engine restarts and during this time you will lose the network connection ("Connection Status" = **NOT connected**).
- After the restart, the program reconnects and checks the "Firmware" and "Config" statuses again.

The "Firmware" status should now be **up to date** and you can continue on to the configuration.

7.4.3 Updating the Configuration

The "Config" status shows if a new configuration is **available**. This can occur when a new version of software is released (to support new functionality), or if you choose the alternate configuration in the **Button Start/Fader Start** drop-down menu.



1. Start by selecting the correct console edition, either **Button Start** or **Fader Start** - the "Config" status updates accordingly.
2. Click on **Transfer Config** to start the file transfer.

The "Config" status message shows **update in progress** and then **update DONE**. The transfer may take a few seconds.

2. Following the transfer, the Compact Engine restarts and during this time you will lose the network connection ("Connection Status" = **NOT connected**).
3. After the restart, the program reconnects and checks the "Config" status again.

The status should now be **up to date** and you can continue on to the next task.

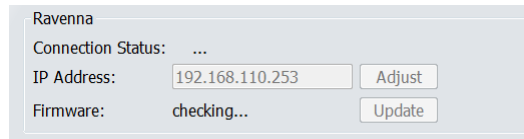
7.4.4 Updating the RAVENNA IO Card

In the Compact Engine, the RAVENNA IO card has its own firmware which must be checked and updated separately.

To do this, you will need a valid network connection to one of the streaming ports, either ETHERNET A or ETHERNET B. You can check the current network settings from the Compact Engine's front panel display.

If ETHERNET B has not been configured for streaming, then its default IP address = 192.168.110.253. To make the connection, you may need to adjust the [network settings](#) of your PC's LAN port.

1. To establish a connection, enter the IP Address of the streaming port into the "IP Address" field, and select **Adjust**:



2. Once a valid network connection is detected, the "Connection Status" will show **Connected**, and the program begins checking the "Firmware" status - this may take a few seconds.

If the "Connection Status" shows an **ERROR**, then there is a problem with the network communication. Check that the "IP Address" has been entered correctly. Then check the physical connections and the TCP/IP settings of your computer's Network Interface Card.

3. If new "Firmware" is **available**, then this is shown in the status field. Click on **Update** to start the update.

The "Firmware" status message shows **update in progress** while the necessary data is transferred. This may take a while.

4. Once the update is complete, the "Firmware" status changes to **done**.

The RAVENNA IO card update is now complete. Note that, in this instance, the Compact Engine does not require a restart.

7.4.5 Selecting the DisplayDock Monitor

At the bottom of the DisplayDock Admin window, you can select the monitor which will be used for the DisplayDock GUI. If only one monitor is connected, then this is automatically selected. If the PC has more than one monitor connected, then you will see multiple entries. In each case, the resolution is shown in the monitor icon.

To change the monitor used by the DisplayDock start script:

1. Click on an icon to select the monitor you wish to use - an ID appears briefly on the connected screen.
2. Then close DisplayDock Admin to update the start script accordingly.

When you next open the DisplayDock session, the GUI will appear on the selected monitor.

7.5 Licensing

To launch the DisplayDock GUI, you will require an active software license. This can be installed into a local container (on your PC), a remote container (on a networked server), or onto a USB dongle (for portability). If you wish to use a dongle, then this must be ordered separately.

The license is activated and managed by the CodeMeter Runtime licensing system from [WIBU systems](#). The license code can be found on the delivery note shipped with the system.

7.5.1 Using a Dongle

All dongles are specially-configured USB memory sticks which can be purchased from either [Lawo](#) or [WIBU systems](#). The dongles supplied for software and hardware products ship with different file systems, so please take care not to mix up the different types. If you have purchased a dongle for DisplayDock, then this will have a metal "LAWO logo" tag attached as shown below. Multiple software products can be licensed from a single dongle.

USB Dongle (for Lawo software)



7.5.2 Preparing for Activation

To activate a license, you will need:

- A PC with an internet connection (and USB port if using a dongle). If your PC does not have an internet connection, then the offline activation method can be used.
- The WIBU systems USB memory stick (if using a dongle).
- The license code. This can be found on the delivery note shipped with the system. It takes the form of a 25-digit ticket number such as the one shown below.

License Code Example

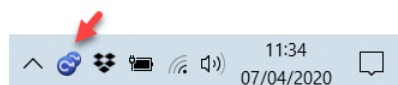
Ticket:
7MAMJ-8HZ95-N9VW5-3MKX6-LWUYM

Once activated, it is strongly recommended that you backup your licenses (using the **CodeMeter WebAdmin** portal). This will allow you to restore a license if the original is lost or damaged.

7.5.3 Installing CodeMeter Runtime

To activate a license, your PC must be installed with **CodeMeter Runtime** (from WIBU systems). The correct version is installed automatically with the setup software for your product.

You can check the installation by looking in the Windows taskbar where you should see the following icon.

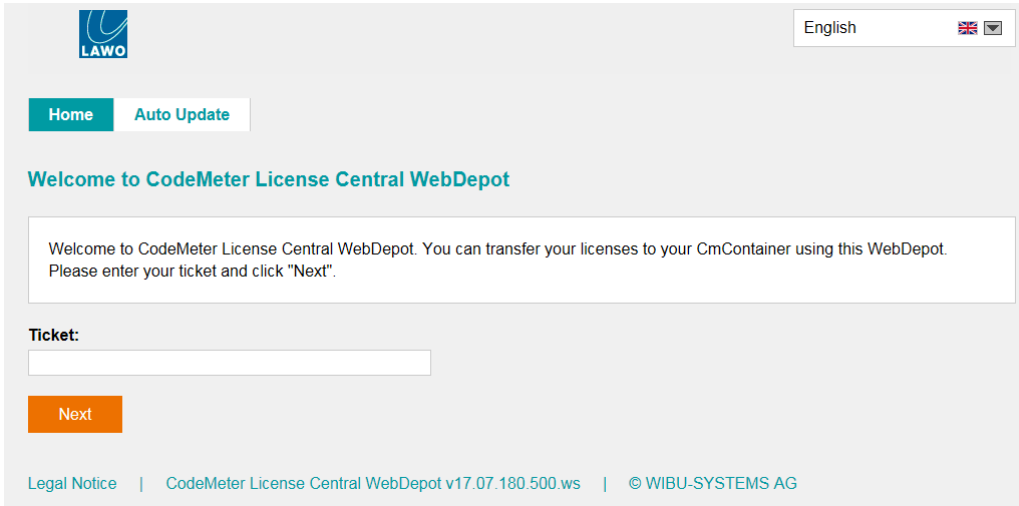


This shows that a Cm container (for local license storage) has been installed.

7.5.4 Activating a License Online

To use this method, your PC must have an internet connection. If installing onto a dongle, then this should be connected to the PC's USB port.

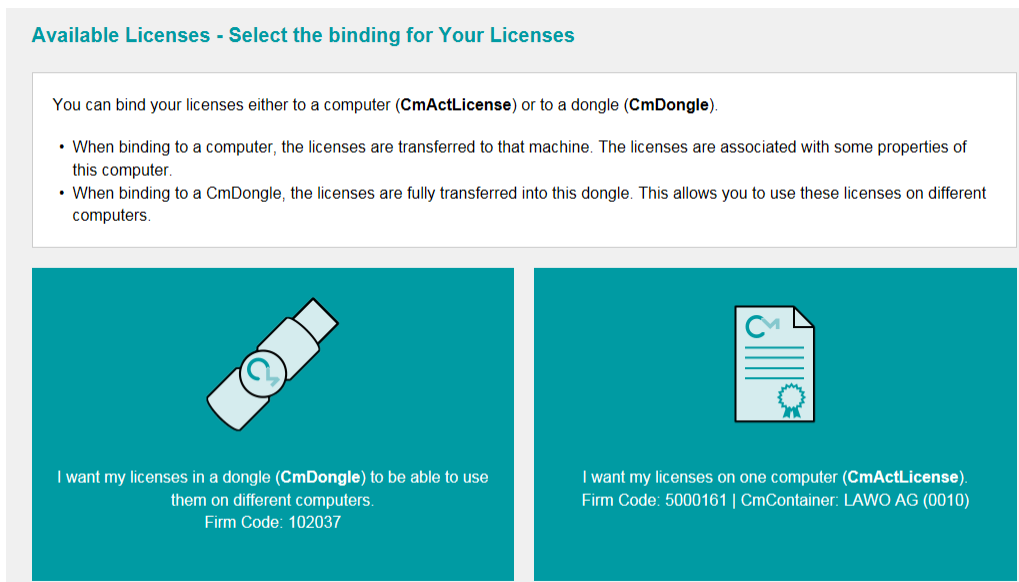
1. Open the Lawo licensing web page by copying the following URL into your web browser:
<https://licenseportal.lawo.com>



If necessary you can choose a different language using the drop-down menu at the top right of the page.

2. Copy your license ticket number - this is the 25-digit number code - into the **Ticket** field and select **Next**.
3. The WebDepot searches for and displays your licenses - select **Activate Licenses** to continue.
4. At the next page, select the storage method for your license - note that this cannot be altered later.

Choose either **CmDongle** (to create a USB dongle) or **CmActLicense** (to bind the license to the local computer).



5. At the next page, select the licenses you wish to activate and the **CmContainer** to be used for the license storage.

Available Licenses

To activate your licenses:

1. Select the licenses you want to activate.
2. Select the locally connected CmContainer to which you want to transfer the licenses.
3. Click "Activate Selected Licenses Now".

| <input checked="" type="checkbox"/> Name | Activated On | CmContainer | Status |
|--|--------------|-------------|-----------|
| <input checked="" type="checkbox"/> *Product Name* <small>(License Quantity: 1)</small> | | | Available |

Select CmContainer

128-2311304 (LAWO AG) ↻

Activate Selected Licenses Now Offline license transfer

[◀ Select binding](#)
[◀ My Licenses](#)

You can store multiple licenses in the same container. If no Cm containers are available, then you will see an option to **"Get CmContainer automatically"**.

6. Click on **Activate Selected Licenses Now** and wait for a few seconds - a confirmation pop-up appears once the activation is successful:

Online License Transfer

! **Please wait!** The selected licenses are transferred. **This process may take several minutes to complete.** Please do not remove the CmContainer during this process and do not reload this page.

Starting license transfer.
Creating license request.

Online License Transfer

Starting license transfer.
Creating license request.
Downloading license update.
Importing license update to CmContainer.
Creating receipt.
Uploading receipt.

✔ License transfer completed successfully!

OK

7. After selecting **OK**, a summary appears:

Home
My Licenses
Auto Update

My Licenses

| Name | Activated On | CmContainer | Status |
|--|---------------------|-------------|------------------|
| *Product Name* <small>(License Quantity: 1)</small> | 2018-07-05 18:33:51 | 128-2311304 | Available: 0 (1) |

Re-Host Licenses

8. You can now close the browser and return to your Lawo software application or install the USB dongle. For information on re-hosting a license, offline activation, backup/restore and using a license server, please see the [Advanced Licensing Features](#) appendix.

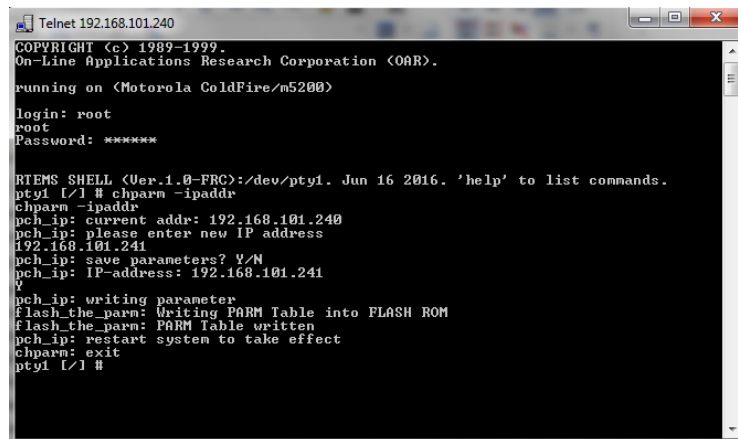
7.6 Editing the System IP Settings

If you are installing the system into a network containing other devices, then you will need to edit the IP settings of the Compact Engine's ETHERNET port. This can be achieved by opening a telnet session as follows.

1. Open a [Telnet session](#) to the crystal standard configuration system.
2. Once login is complete, type in "**chparm -ipaddr**" (press ENTER) to start the set IP address script.
3. When prompted, enter the new IP address for the system and press ENTER.
4. You are asked to confirm so type "Y" to confirm (press ENTER).

The syntax is case sensitive, so be sure to enter a capital Y. You will see the following messages if the IP has been accepted.

Telnet: set IP address



```

Telnet 192.168.101.240
COPYRIGHT (c) 1989-1999.
On-Line Applications Research Corporation (OAR).
running on (Motorola ColdFire/m5200)
login: root
root
Password: *****

RTIEMS SHELL (Ver.1.0-FRC):/dev/pty1. Jun 16 2016. 'help' to list commands.
pty1 [/] # chparm -ipaddr
chparm -ipaddr
pch_ip: current addr: 192.168.101.240
pch_ip: please enter new IP address
192.168.101.241
pch_ip: save parameters? Y/N
pch_ip: IP-address: 192.168.101.241
Y
pch_ip: writing parameter
flash_the_parm: Writing PARM Table into FLASH ROM
flash_the_parm: PARM Table written
pch_ip: restart system to take effect
chparm: exit
pty1 [/] #

```

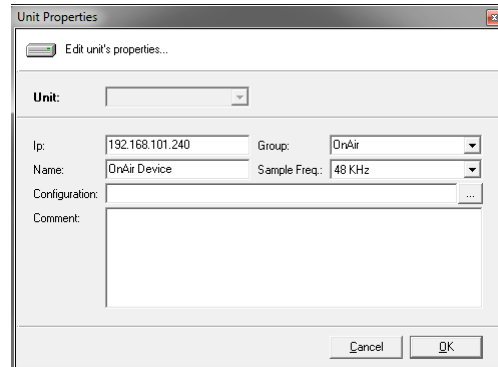
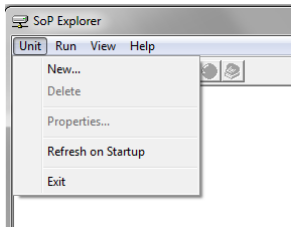
5. Now type "**chparm -restart**" followed by "YES" to confirm.

The Compact Engine restarts and so the telnet window closes. The new IP address is loaded at the end of the restart. You can check the new settings from either the front panel display or Web UI (via the [Supplementary Information](#) page). If the new IP address is in a different IP range to the default, then you may need to edit the IP settings on the control PC to re-establish the network connection.

7.7 Setting the System Date and Time

The system date and time is provided by your network's NTP server (if one is present), or by the unit's internal Real Time Clock (RTC). The internal clock can be set using SoP Explorer. The procedure will transfer the date and time from the control PC to the system as a one-shot snapshot. So take care to check the settings on the control PC before you begin.

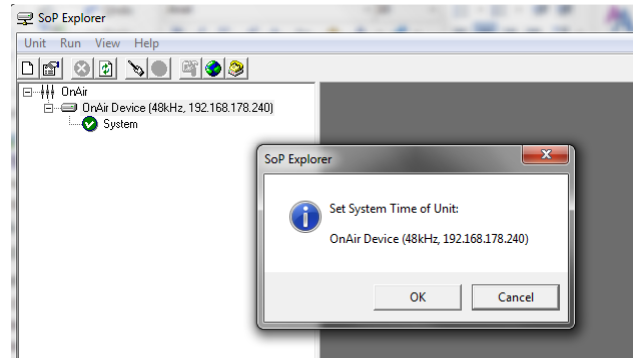
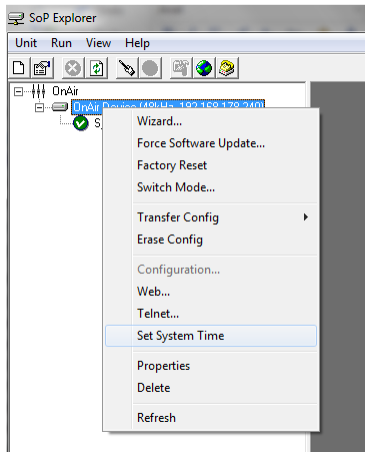
1. Start the application by selecting **START -> Program Files -> SoP Explorer**.
2. Select **Unit -> New...** from the main menus, enter the IP address of the Compact Engine and select **OK** to add the unit.



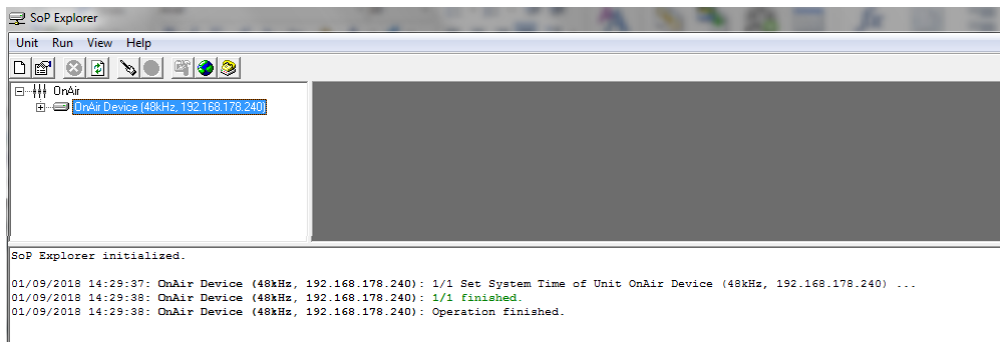
SoP Explorer connects to the Compact Engine and analyses the current firmware revisions.

If a red **X** appears beside the unit, then there is a problem with the network connection. Check the network cabling and the IP settings of the PC and the Compact Engine.

3. Right-click on the unit and select **Set System Time**. Then confirm by selecting **OK**.



The software now sets the system date and time to match that of the control PC. The success (or failure) of the reset is shown in the SoP Explorer status area:



7.8 Setting the Time Zone

The time zone can be edited by opening a telnet session to the Compact Engine.

1. Open a [Telnet session](#) to the crystal standard configuration system.
2. Once login is complete, type "**chparm -tz**" (press ENTER).
3. Select option **1** (press ENTER).
4. When prompted, enter the new time zone rule and press ENTER.

The time zone should be specified relative to Central European Time (CET).

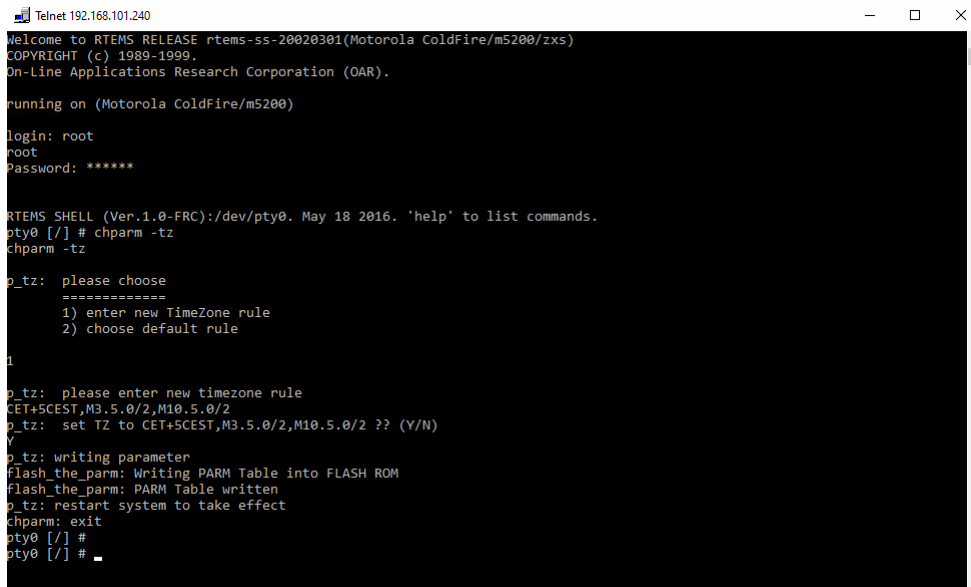
For example, "CET+5CEST,M3.2.0/2:00,M11.1.0/2:00" is suitable for US East Coast, where CET is 5 hours ahead.

The second part of the syntax specifies the start and end of Central European Summer Time (CEST). e.g. from month 3, week 2, day 0, time 2am (the second Sunday in March) until month 11, week 1, day 0, time 2am (the first Sunday in November).

5. You are asked to confirm so type "**Y**" to confirm (press ENTER).

The syntax is case sensitive, so be sure to enter a capital Y. You will see the following messages if the new rule has been accepted.

Telnet: set time zone



```

Telnet 192.168.101.240
Welcome to RTEMS RELEASE rtems-ss-20020301(Motorola ColdFire/m5200/zxs)
COPYRIGHT (c) 1989-1999.
On-Line Applications Research Corporation (OAR).

Running on (Motorola ColdFire/m5200)

login: root
root
Password: *****

RTEMS SHELL (Ver.1.0-FRC):/dev/pty0. May 18 2016. 'help' to list commands.
pty0 [/] # chparm -tz
chparm -tz

p_tz: please choose
=====
    1) enter new TimeZone rule
    2) choose default rule
1

p_tz: please enter new timezone rule
CET+5CEST,M3.5.0/2,M10.5.0/2
p_tz: set TZ to CET+5CEST,M3.5.0/2,M10.5.0/2 ?? (Y/N)
Y
p_tz: writing parameter
Flash_the_parm: Writing PARM Table into FLASH ROM
Flash_the_parm: PARM Table written
p_tz: restart system to take effect
chparm: exit
pty0 [/] #
pty0 [/] #
  
```

6. Now type "**chparm -restart**" followed by "**YES**" to confirm.

The Compact Engine restarts and so the telnet window closes. The new time zone is loaded at the end of the restart. You can check the new settings from the Web UI (via the [DSP Card Information](#) page).

7.9 Setting Up RAVENNA/AES67

7.9.1 Introduction

This section is intended as an introduction to configuring and setting up RAVENNA streams. It covers the typical configuration process and is in no way exhaustive or prescribing of how a customer should configure their system. Some questions one should ask oneself are: how redundant the network needs to be; should the audio network be standalone; how are the streams to be routed and controlled; where do all the audio streams need to be routed to; etc.

Please note that RAVENNA requires a properly configured external network infrastructure to function correctly and defining such is beyond the scope of this manual. Please refer to and consult your network administrator and architect for network specific questions and settings.

The streaming network *must* be properly configured and managed. i.e. it must use a suitable network architecture; all components must support multicast (as opposed to unicast); a proper Quality of Service (QoS) must be configured; and so on.

Please *DO NOT* attempt to connect the streaming ports using an unqualifying IP network, as correct operation cannot be guaranteed.

You can find more details about the data network requirements in the [Lawo IP Networking Guide](#).

7.9.2 What the Configuration Provides

32 stereo Rx and Tx streams are pre-configured. These are fully compatible with AES67 and RAVENNA.

By default, the 32 stereo streams are transmitted and received via the ETHERNET A port, while ETHERNET B remains unused. Optionally, you can re-configure the two ports to support redundant streaming (via SMPTE ST2022-7). This requires some modification of the streaming configuration and also a supporting network infrastructure.

7.9.3 Using the RAVENNA Web UI

The RAVENNA Web UI is used for four main tasks:

- To change the IP settings of the streaming ports.
- To check the synchronization status of the PTP clock source.
- To assign audio to the 32 stereo Rx streams.
- To check the status of the Tx streams.

Note that the latest settings are stored locally on the device, and are re-instated following a power cycle or reboot.

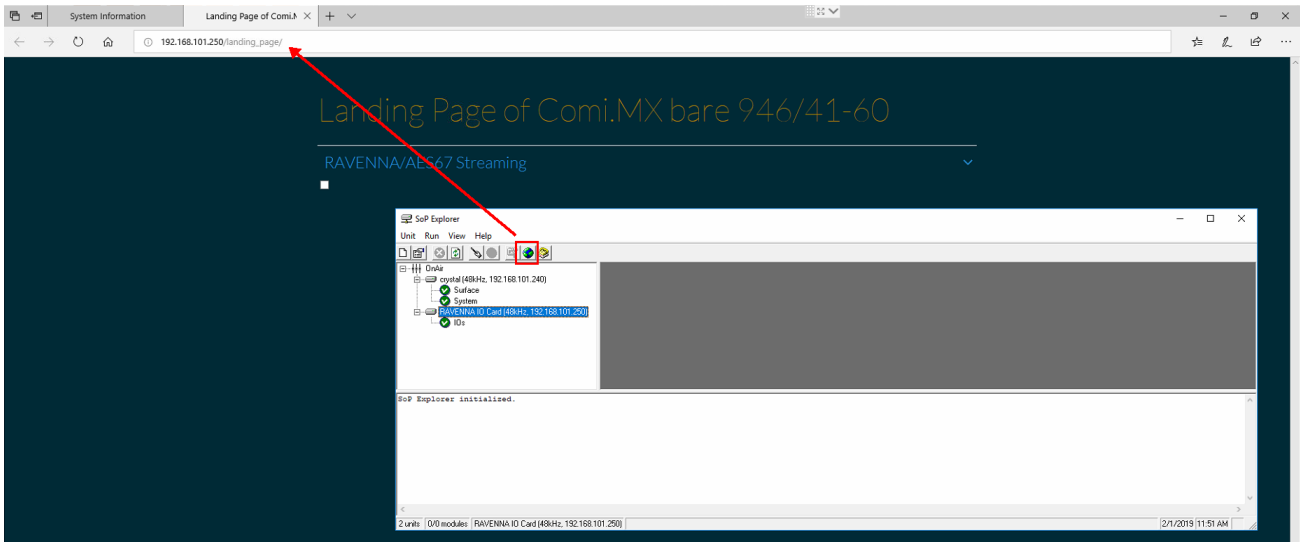
Any settings changed from the RAVENNA Web UI can be backed up (and restored) using the "Backup & Restore Config" tool. This is ideal if you need to exchange an IO card or device.

7.9.4 Opening the RAVENNA Web UI

The RAVENNA Web UI can be launched from SoP Explorer as follows:

1. Select the RAVENNA IO Card and then click on the "run web browser" icon - the Comi.MX Landing Page appears:

SoP Explorer - opening the Landing Page

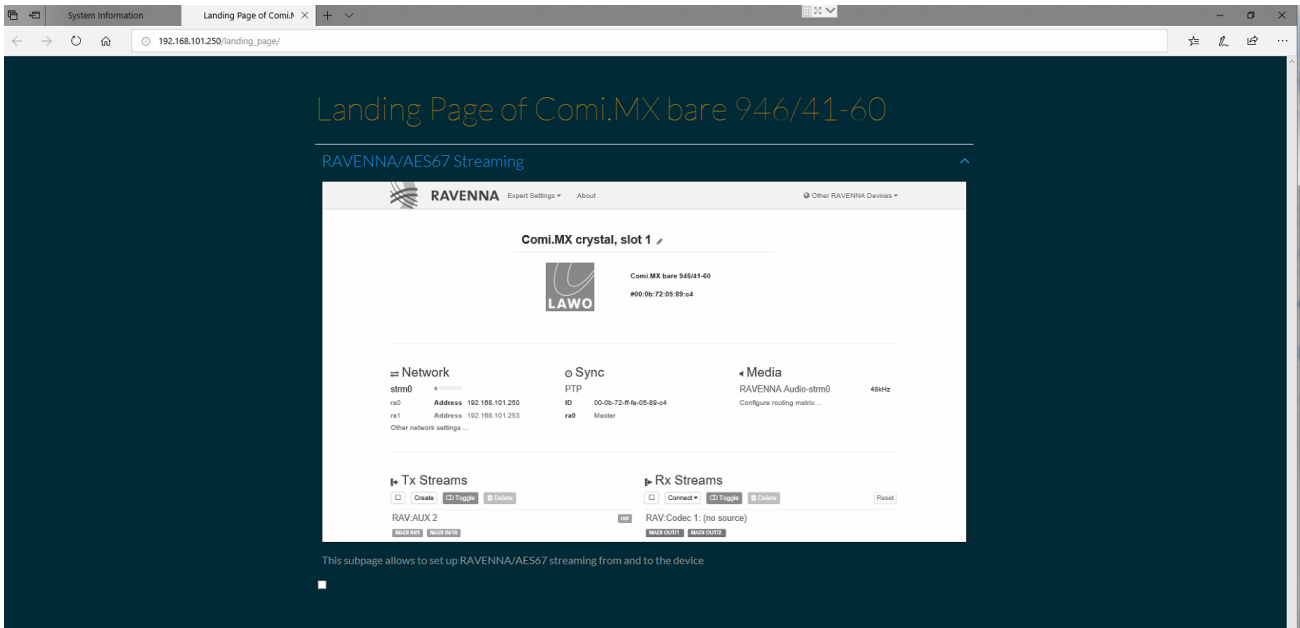


Alternatively, open a web browser application and enter the IP address of the connected streaming port into the URL field. The default IP addresses are:

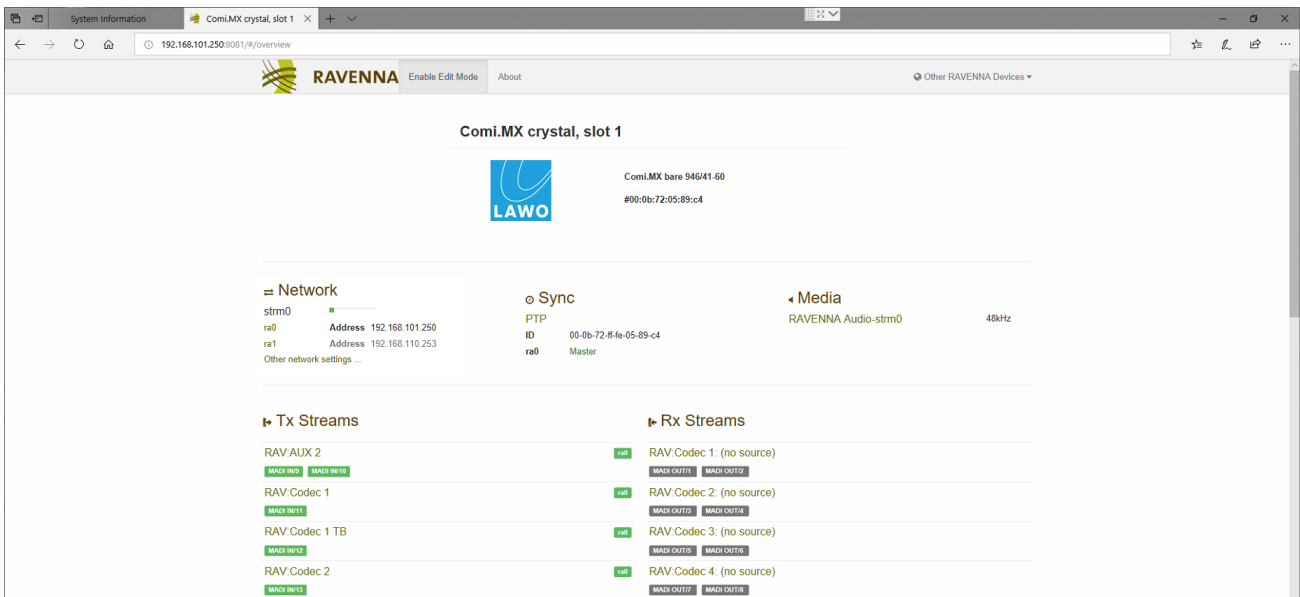
- ETHERNET A = 192.168.101.250
- ETHERNET B = 192.168.110.253

- Click on the text "RAVENNA/AES67 Streaming" and then on the graphical preview to open the RAVENNA Web UI Home page.

Landing Page - opening the RAVENNA Web UI



RAVENNA Web UI (Home page)

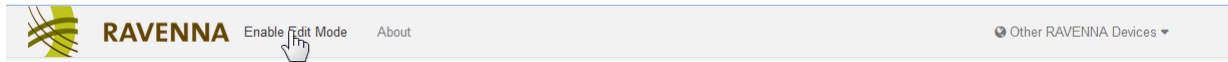


Note that the Landing Page preview uses a static library image and does not update in real time or represent the actual settings on the connected device!

7.9.5 Enabling Expert Mode

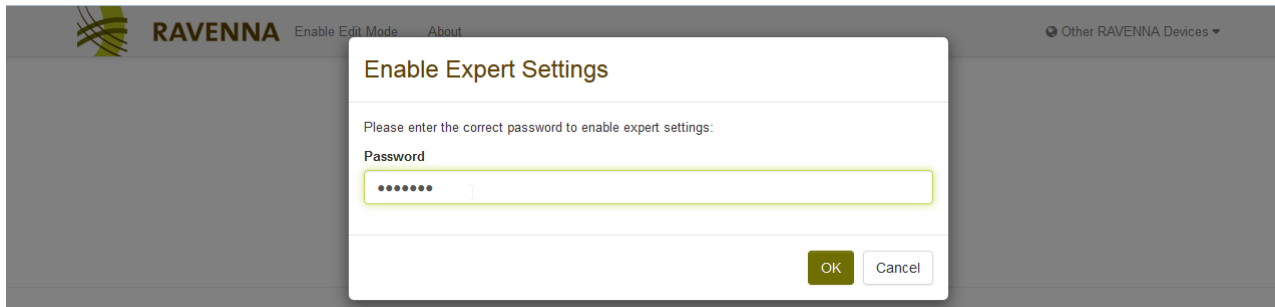
Many operations are hidden from view unless you are running in expert mode. To enable expert mode:

1. Select **Enable Edit Mode** from the headline at the top of the Home page:



A pop-up window appears.

2. Type in the Password - **ravenna** - and click **OK**



The Home page updates to show all of the locked functions, and **Enable Edit Mode** updates to **Expert Settings** (to access to the "Expert Settings" menu).

7.9.6 Default IP Settings

The Compact Engine is shipped with the following IP settings assigned to the RAVENNA IO card.

Default IP addresses:

- ETHERNET A = 192.168.101.250
- ETHERNET B = 192.168.110.253

Default subnet mask = 255.255.255.0

Note that, in the RAVENNA Web UI, the two ports are labeled as follows:

- ETHERNET A = streaming port ra0
- ETHERNET B = streaming port ra1

7.9.7 Modifying the IP Settings

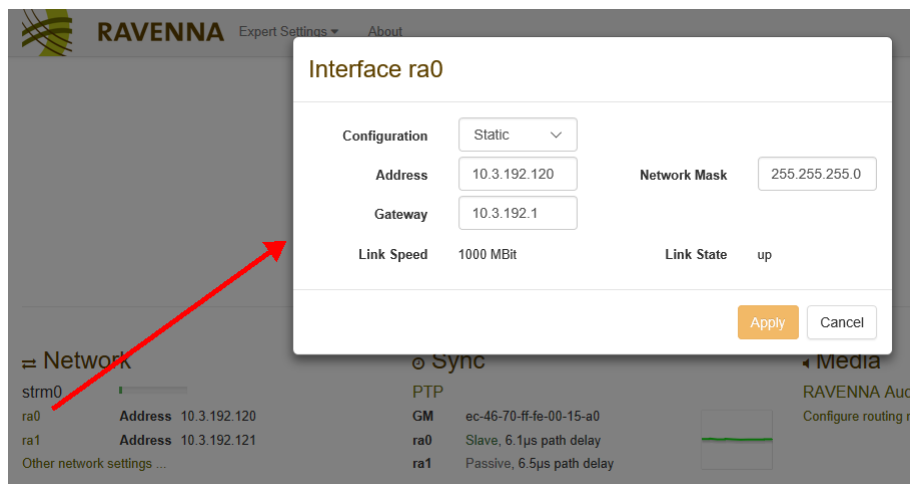
The IP address of each streaming port in the AoIP network must be unique; static IP addresses are recommended. Therefore, before you connect the streaming ports to the network, you *must* check and modify their IP settings. This is handled by the RAVENNA Web UI.

If redundant streaming is not required, then the ETHERNET B port can be left unconnected (and set to its default IP address). This allows it to be used for service tasks such as updating the IO card's firmware (using SoP Explorer).

To edit the IP Settings:

1. From the **Network** area, click on an interface (e.g. **ra0**) to view its individual settings:

RAVENNA Web UI (Default Network Settings for ra0)

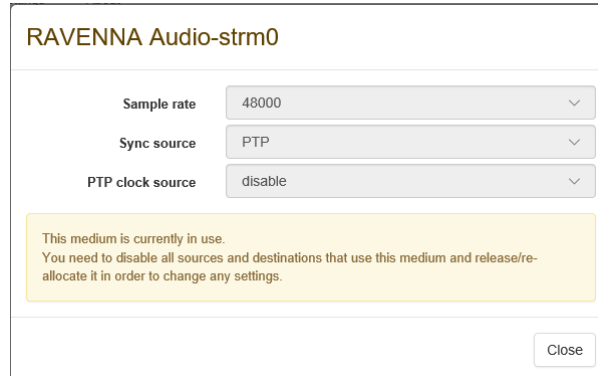


2. Or, click on **Other network settings** to view the general settings applied to all ports.
2. Use the fields to type in a value or select a menu option.
3. If you make a change, select **Apply** to confirm (or **Cancel**).
4. Then select **Reboot** - the device must be rebooted before the new settings take effect, which means that you will lose your browser connection.
5. Once the reboot is complete, [re-open](#) the RAVENNA Web UI to check the changes.

7.9.8 Synchronization (PTP)

A crystal standard configuration system will automatically use the highest prioritized sync source (if a valid signal is present): MAD1, Wordclock, AES3 or internal clock. Note that the MAD1 option actually means PTP, due to the internal workings of the system.

RAVENNA Web UI (Default Media Settings)



RAVENNA Audio-strm0

Sample rate: 48000

Sync source: PTP

PTP clock source: disable

This medium is currently in use.
You need to disable all sources and destinations that use this medium and release/re-allocate it in order to change any settings.

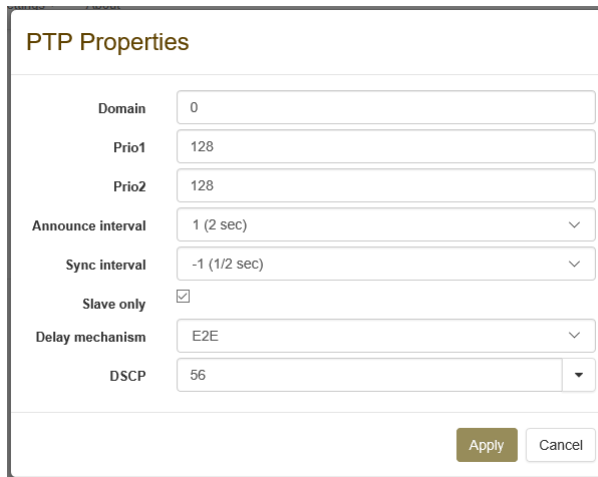
Close

Two global PTP modes are possible: Master / Slave mode, and Slave Only mode.

- For most installations, Lawo recommends Slave Only mode. In this mode, the RAVENNA IO Card works in conjunction with an external PTP grandmaster clock. This mode is required for any installation where RAVENNA port redundancy with automatic failover switching is desired.
- Master / Slave mode is provided as a convenience for users with no more than two consoles and a few RAVENNA devices. In this mode, the RAVENNA IO Card supplies its own clock sync. RAVENNA port redundancy is not available in this mode.

From the Home page, click on **Sync** to view the current PTP settings:

RAVENNA Web UI (Default Sync Settings)



PTP Properties

Domain: 0

Prio1: 128

Prio2: 128

Announce interval: 1 (2 sec)

Sync interval: -1 (1/2 sec)

Slave only:

Delay mechanism: E2E

DSCP: 56

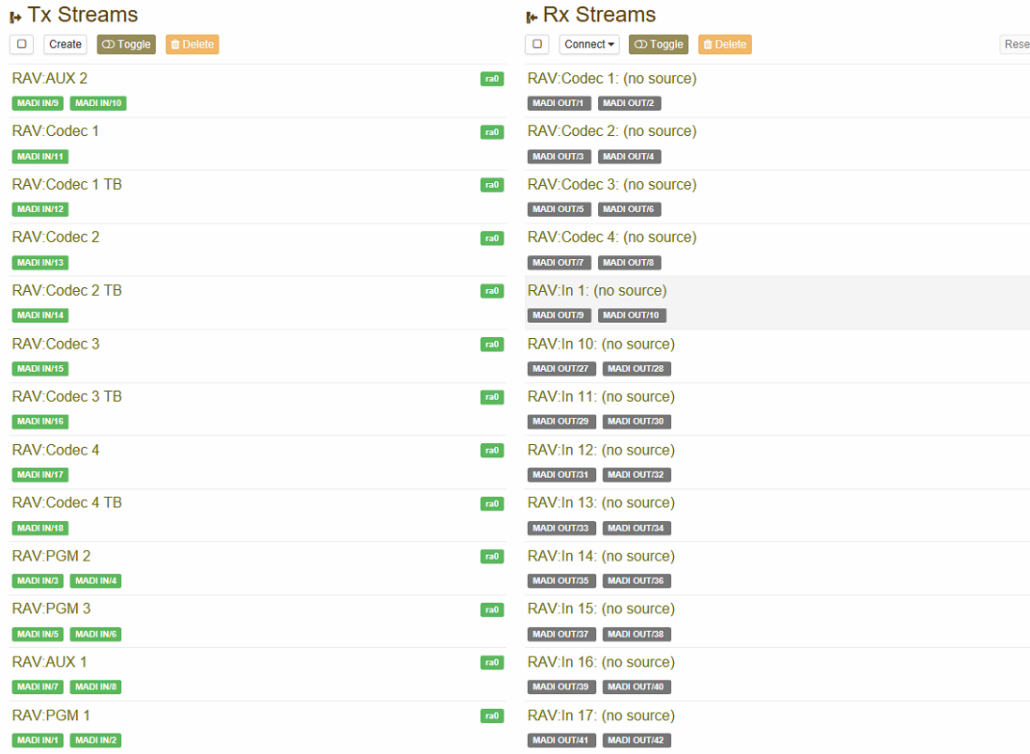
Apply Cancel

7.9.9 Assigning Audio to the RAVENNA Inputs (Rx Streams)

The 32 stereo Rx streams come pre-labeled and connected to sources (by the ON-AIR Designer configuration). So, to receive audio from the network, you will need to assign an incoming source to each pre-configured stream.

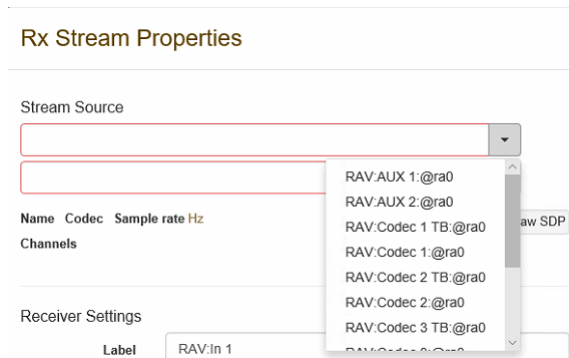
Following a fresh installation, you will see that there is "no source" assigned to any of the Rx streams:

RAVENNA Web UI (Default Stream Setup)



1. Click on a Rx stream (e.g. RAV In 1) and use the 'Stream Source' field to select an incoming stream.

RAVENNA Web UI (Rx Stream - select source)



Note that you will see the outgoing streams from your local device in addition to streams arriving from the rest of the network.

All other settings should be left unchanged.

2. Once you have chosen a stream, click on **Apply** - the Rx stream name on the Home page updates to show the stream name in ().

If the source RAV In 1 is assigned to a fader strip, then it should now be receiving some audio.

7.9.10 Checking the RAVENNA Outputs (Tx Streams)

The stereo Tx streams can also be pre-labeled and connected from outputs by the configuration. They can be seen in the Tx Streams list when you open the RAVENNA Web UI Home page.

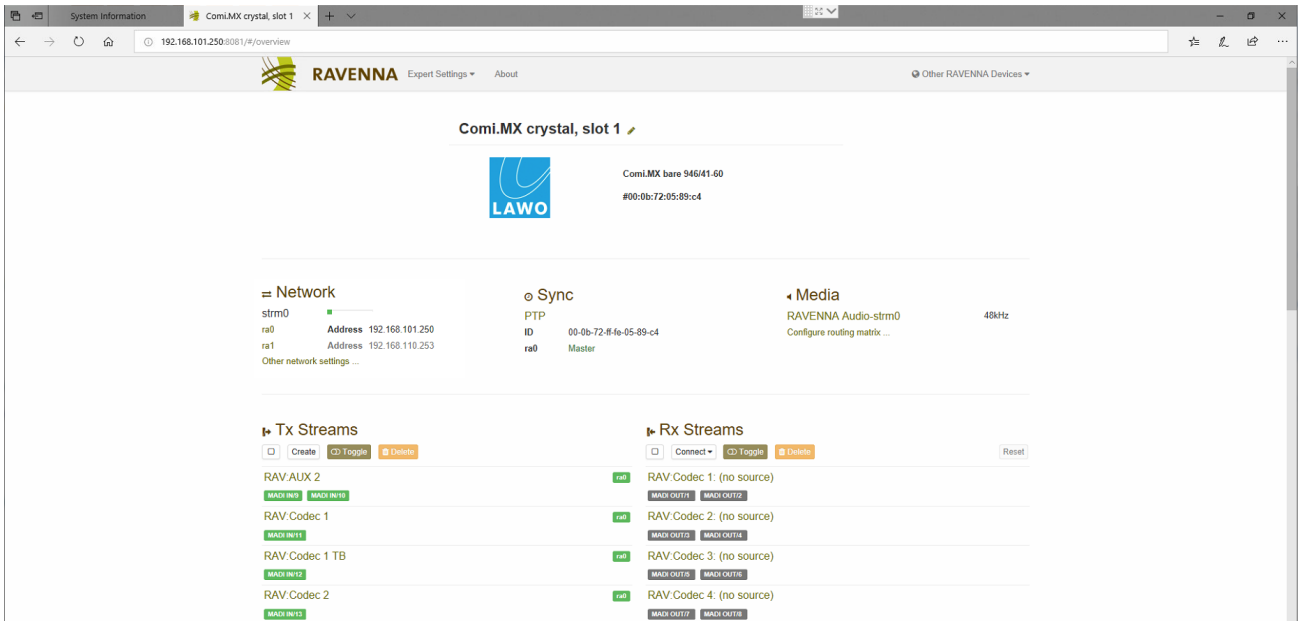
Unless you wish to create additional Tx streams, there is no need to edit the configuration from the Web UI.

RAVENNA Web UI (Default Stream Setup)

| Tx Streams | | Rx Streams | |
|---|-----|--|--------------------------------------|
| <input type="button" value="Create"/> <input type="button" value="Toggle"/> <input type="button" value="Delete"/> | | <input type="button" value="Connect"/> <input type="button" value="Toggle"/> <input type="button" value="Delete"/> | <input type="button" value="Reset"/> |
| RAV:AUX 2 | ra0 | RAV:Codec 1: (no source) | |
| MADI IN/9 MADI IN/10 | | MADI OUT/1 MADI OUT/2 | |
| RAV:Codec 1 | ra0 | RAV:Codec 2: (no source) | |
| MADI IN/11 | | MADI OUT/3 MADI OUT/4 | |
| RAV:Codec 1 TB | ra0 | RAV:Codec 3: (no source) | |
| MADI IN/12 | | MADI OUT/5 MADI OUT/6 | |
| RAV:Codec 2 | ra0 | RAV:Codec 4: (no source) | |
| MADI IN/13 | | MADI OUT/7 MADI OUT/8 | |
| RAV:Codec 2 TB | ra0 | RAV:in 1: (no source) | |
| MADI IN/14 | | MADI OUT/9 MADI OUT/10 | |
| RAV:Codec 3 | ra0 | RAV:in 10: (no source) | |
| MADI IN/15 | | MADI OUT/27 MADI OUT/28 | |
| RAV:Codec 3 TB | ra0 | RAV:in 11: (no source) | |
| MADI IN/16 | | MADI OUT/29 MADI OUT/30 | |
| RAV:Codec 4 | ra0 | RAV:in 12: (no source) | |
| MADI IN/17 | | MADI OUT/31 MADI OUT/32 | |
| RAV:Codec 4 TB | ra0 | RAV:in 13: (no source) | |
| MADI IN/18 | | MADI OUT/33 MADI OUT/34 | |
| RAV:PGM 2 | ra0 | RAV:in 14: (no source) | |
| MADI IN/3 MADI IN/4 | | MADI OUT/35 MADI OUT/36 | |
| RAV:PGM 3 | ra0 | RAV:in 15: (no source) | |
| MADI IN/5 MADI IN/6 | | MADI OUT/37 MADI OUT/38 | |
| RAV:AUX 1 | ra0 | RAV:in 16: (no source) | |
| MADI IN/7 MADI IN/8 | | MADI OUT/39 MADI OUT/40 | |
| RAV:PGM 1 | ra0 | RAV:in 17: (no source) | |
| MADI IN/1 MADI IN/2 | | MADI OUT/41 MADI OUT/42 | |

7.9.11 Troubleshooting

RAVENNA Web UI (Home page, Expert enabled)



Sync

This area shows the status of the PTP clock source. What you see will vary slightly depending on the device's PTP mode: master-slave or slave only:

Master-Slave (device running as PTP Master):

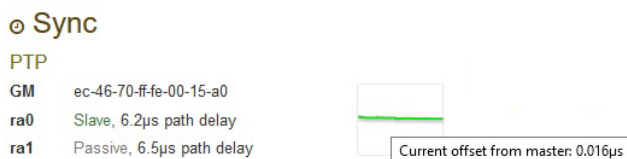
- Beside **ID** you will see the MAC address of the device. Hover your mouse over the MAC address to reveal its IP address.
- The text "**Master**" indicates the interface(s) which are transmitting PTP to the network.

Slave only:

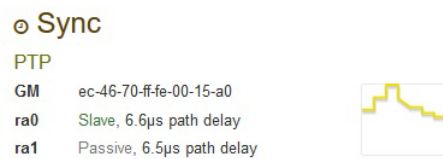
- Beside **GM** you will see the MAC address of the current grandmaster device. Hover your mouse over the MAC address to reveal its IP address.
- Beside each streaming interface, you will see **passive** if the interface is inactive, or **Slave** if the interface is active and operating in Slave only mode. You will also see **Disabled** if the ra1 interface is not activated.
- You will also see the amount of **path delay**, otherwise known as the differential delay. This is the delay caused by the time it takes the packets to travel between the PTP master and slave device.

The graphical area monitors the PTP clock source over time:

PTP Signal OK



PTP Signal in error



The graph should be green if the device is receiving or transmitting a valid PTP signal. The graph will change to orange or red if there is a problem with the PTP signal. Hover your mouse over the graph to reveal further information.

- Click on **PTP** to view or edit the PTP Properties for the device.

Tx Streams

This area defines the sending streams, which are used to publish audio from the device to the network. The Tx streams are pre-defined by the crystal standard configuration. In each case, you will see the Tx stream name and the RAVENNA media channels which are being used.

For Tx streams, the media channels are color-coded as follows: green = the stream is active; grey = the stream is inactive.

The buttons at the top of the area should not be used unless you wish to **Create** a new stream.

Do NOT use **Toggle** or **Delete**, as these buttons will activate/deactivate or delete the selected Tx streams!

Rx Streams

This area defines the receiving streams, which are required to use audio from the network. The crystal standard configuration pre-labels the 32 stereo Rx streams and connects them to the RAVENNA sources on the console. In order to receive audio, you must assign an incoming stream from the network (as described [earlier](#)).

Once a Stream Source has been assigned, then the Rx stream shows its name and the RAVENNA media channels which are being used.

For Rx streams, the media channels are color-coded as follows: green = correct operation; red = there is either no connection or no data; orange = the stream is being received but there are drop-outs in the data; grey = the stream is inactive.

You will also see an icon on the right of each Rx stream which reflects the health statuses:

- Click on the icon to open the statistics window for further information.
- To reset all of the error flags for the Rx streams, click on the **Reset** button.

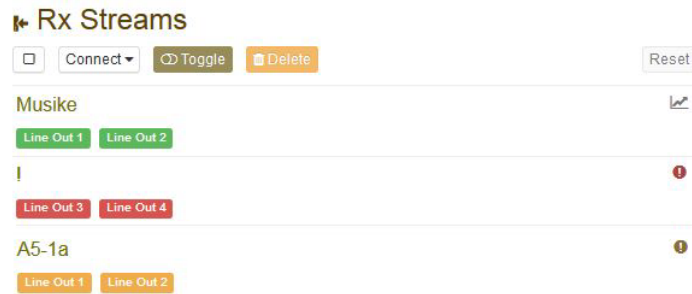
The buttons at the top of the area should not be used.

In particular, do NOT use **Toggle** or **Delete**, as these buttons will activate/deactivate or delete the selected Rx streams!

The **Create** button is used in systems other than crystal standard configuration to create a new Rx stream.

7.9.12 Statistics Window

On the [Home](#) page, each Rx stream name is color-coded to indicate the health of the stream:



- **Green** = correct operation.
- **Red** = there is either no connection or no data.
- **Orange** = the stream is being received but there are drop-outs in the data.

You will also see an icon on the right of each Rx stream which reflects the same statuses.

1. Click on the icon to open the Statistics window - this provides more information about the stream.

Healthy Rx Stream (green)

Musike

This receiver is configured for synchronized mode:
 Received audio samples are put into the receive buffer based on absolute time using the timestamps of the samples and the configured delay (currently set to 512 samples).

Network interface ra0
 Absolute minimum buffer offset (in samples): 463 (last report: 463)
 Absolute maximum buffer offset (in samples): 510 (last report: 510)
 The current median interarrival jitter is 0 samples.
 Show Graphs ▲

Network interface ra1
 Absolute minimum buffer offset (in samples): 463 (last report: 463)
 Absolute maximum buffer offset (in samples): 510 (last report: 510)
 The current median interarrival jitter is 0 samples.
 Show Graphs ▲

Unhealthy Rx Stream (orange)

A5-1a

This receiver is configured for synchronized mode:
 Received audio samples are put into the receive buffer based on absolute time using the timestamps of the samples and the configured delay (currently set to 512 samples).

Network interface ra0
 Absolute minimum buffer offset (in samples): 447 (last report: 447)
 Absolute maximum buffer offset (in samples): 510 (last report: 510)

A total of 163 lost packet(s) has been detected.

The current median interarrival jitter is 0 samples.
 Show Graphs ▲

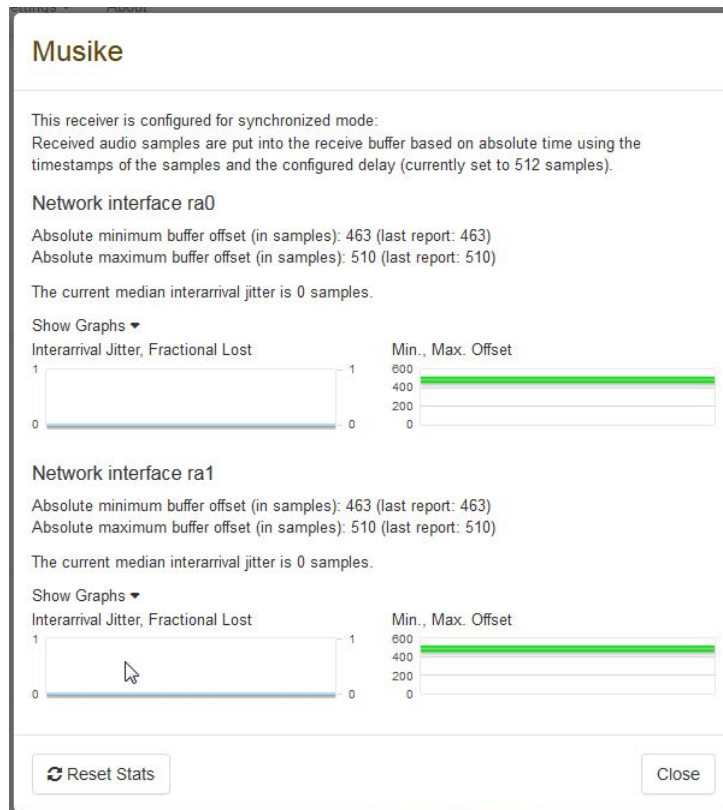
Network interface ra1
 Absolute minimum buffer offset (in samples): 447 (last report: 447)
 Absolute maximum buffer offset (in samples): 510 (last report: 510)

A total of 84 lost packet(s) has been detected.

The current median interarrival jitter is 0 samples.
 Show Graphs ▲

- For a healthy stream (green) or one experiencing drop-outs (orange) you can click on **Show Graphs** for further details:

Healthy Rx Stream (Show Graphs)



- **Fractional Lost Packets** - the number of lost packets over the last few seconds.
- **Min & Max Offset** - information about the receive buffer in samples: on the left is the current value realized every few seconds; on the right is the peak value reached since the last reset.

Note that the **Min Offset** should never reach zero, as this would mean that the buffer was empty. Typically the **Min Offset** should be close to the configured Delay value. The **Max Offset** is dependent on more parameters; critical is the possible maximum buffer - this is 1023 for the 981/61, and 4095 for the 947/21 or 947/22 (DALLIS Master Board).

- Click on **Reset Stats** to clear the statistics history for the selected stream.
- Return to the Home page and click on the **Reset** button to clear the statistics history for all Rx streams.

8. Operation

This chapter describes how to operate the system.

Topics include:

- [Basic Operations](#)
- [Fader Strip Control](#)
- [Source-Specific Functions](#)
- [The Central Modules](#)
- [Assigning Fader Strips](#)
- [Bus Assign](#)
- [Input Gain & Pan](#)
- [DSP Parameters](#)
- [Metering](#)
- [Monitoring & Talkback](#)
- [Master Functions](#)
- [The Advanced Page](#)
- [Editing User Labels](#)
- [Conference Bussing \(N-1/Mix Minus\)](#)
- [Snapshots](#)

8.1 Basic Operations

8.1.1 Starting the System

1. To start the hardware components, apply power to the control surface and Compact Engine.

You will see an initial flicker of LEDs on the control surface modules. On the Compact Engine, the boot-up progress is shown on the front panel display.

At the end of the boot-up, the system loads its latest settings (stored at the last shut down). The hardware components are now ready for operation - this takes approximately 20 seconds from power on.

2. To start DisplayDock, turn on your control PC and double-click on the "**DisplayDock (crystal standard configuration)**" desktop icon.

The session loads and then connects to the hardware. On startup, the DOCK appears on the right of the screen. Providing there are no error messages, the GUI is ready for operation.

If audio is reaching the main PGM 1 output, you will see level on the output meters (on the GUI and the Central Modules).

If the Compact Engine performs either a warm start or cold start while DisplayDock is running, then the message "System has been restarted" appears on top of the Clock/Timer. Click on the message to clear it.

8.1.2 Trouble-shooting

➤ DisplayDock Does Not Open

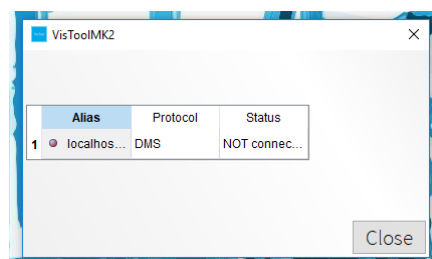
If the DisplayDock GUI does not appear, then there could be a problem with the start script or the selected monitor. Check the settings prepared earlier in [DisplayDock Admin](#).

➤ No License Found

If a software license is not found when you start DisplayDock, then an error message appears. Follow the activation procedure (described [earlier](#)) to activate your license. If the license is installed onto a USB dongle, then check that the dongle is connected to the host PC!

➤ No Hardware Connection

If the DisplayDock GUI opens but there is a problem with the network connection to the Compact Engine, then the following window appears:



In this instance, you should check the following:

- The network cabling and IP settings of the control PC, see [Configuring the Network Settings on the PC](#).
- The IP address of the Compact Engine, see [Editing the System IP Settings](#).

8.1.3 Working with DisplayDock

The DisplayDock GUI is designed for touch-screen operation and so you can simply touch a button to action a function. If touch-screen functionality is not available, then use your mouse and mouse keys to make selections.

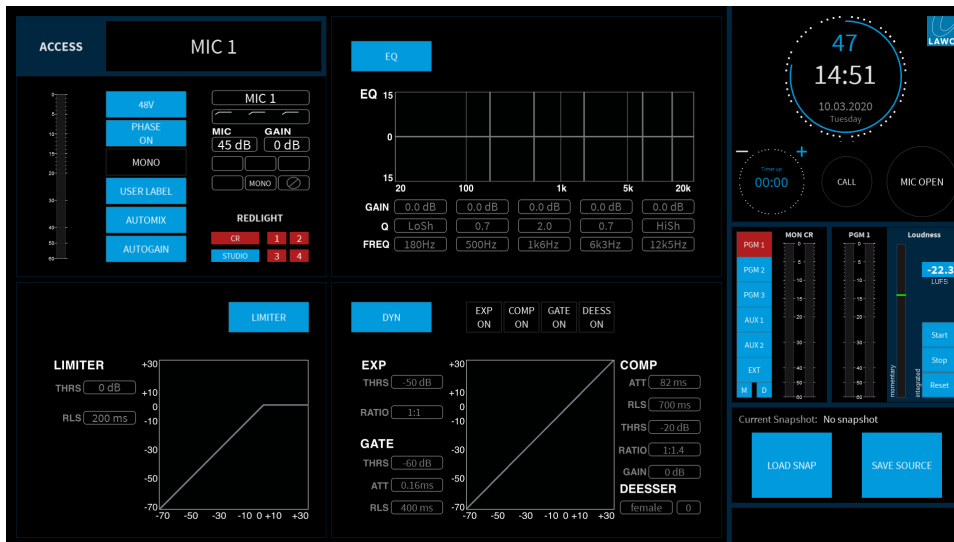
The main page, known as the DOCK, appears on the right of the screen so that it can sit alongside other applications. It provides master functions such as the system clock, timer, mic open indicator, output metering and monitoring selections.

Other pages appear alongside the DOCK as needed. For example, press a fader strip **ACCESS** key and the "Source Parameters" page appears. In each case, the full-screen pages appear to the left of the DOCK, so that the DOCK remains accessible at all times.

DOCK



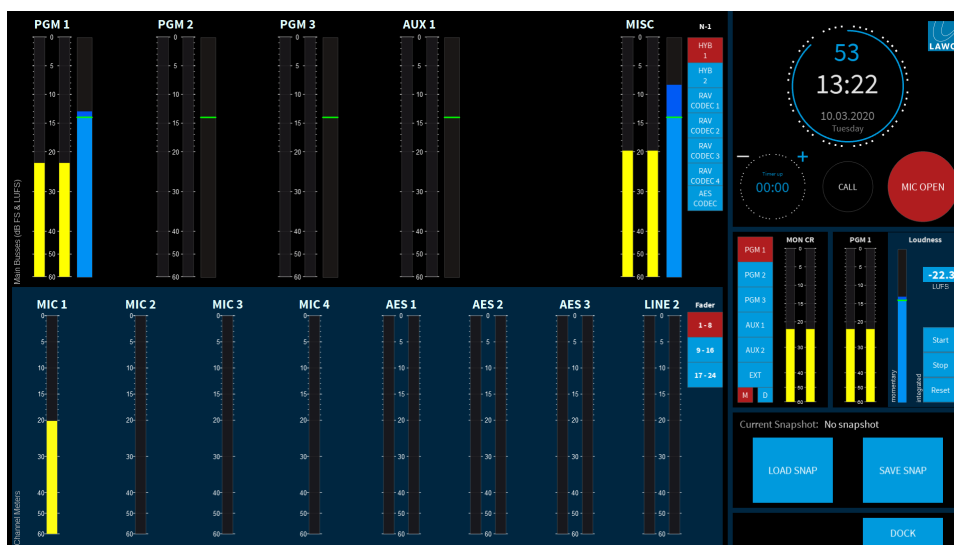
Source Parameters + DOCK



8. Operation

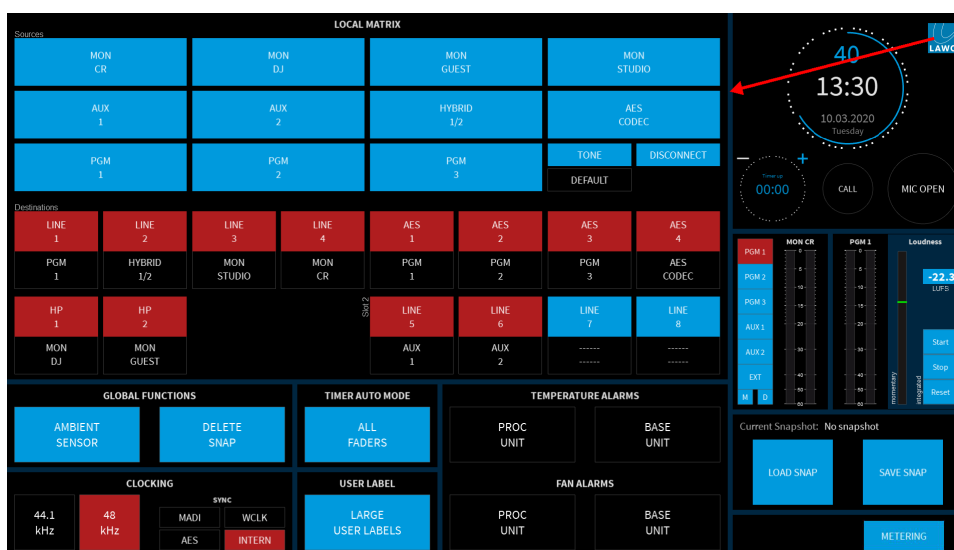
From the DOCK, select **METERING** to open the metering page:

METERING + DOCK



Click on the LAWO logo (top right) to open the advanced page:

ADVANCED + DOCK



You can change page using the **PAGE UP** and **PAGE DOWN** keys on your PC keyboard. This will scroll through all of the available pages.

8.1.4 Shutting Down the System

There is no special shutdown procedure for the hardware components, and so you can turn off the control surface and the Compact Engine by turning off the mains power.

To close DisplayDock, press ALT + F4 on your PC keyboard.

Note that closing DisplayDock on the control PC only closes the current session, and is not the same as restarting the system. To do this you will need to restart the Compact Engine (described [later](#)).

8.2 Fader Strip Control

The console mixes its active sources (mono or stereo) to three stereo main buses: **PGM 1 to 3**, and two stereo aux buses: **AUX 1** and **2**. The active sources are the ones assigned to the control surface fader strips, and so the maximum number of mix inputs is determined by the console frame size.

Each fader strip provides the following controls:

1 Input Gain & Pan

Tap down on the rotary control to step through the available parameters, and then turn to adjust the current value - the parameter name and value appear briefly in the electronic display.

The available parameters vary depending on the type of source. For more details, see [Input Gain & Pan](#).

2 Source-Specific Functions (e.g. CONF, TB, etc.)

The four soft keys are labeled by the electronic display, and vary depending on the type of source. The default functions are described [later](#).

In source parameter control, fader strip assign and bus assign modes, the rotary control (1) and soft keys (2) provide alternative functions.

3 ACCESS Key

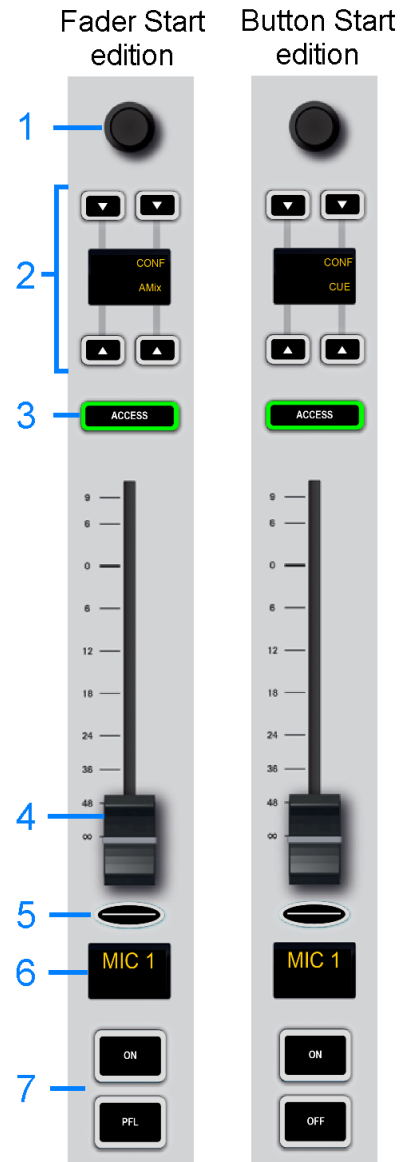
Use the **ACCESS** key to select a source (for parameter control) or activate strip assign mode. The operation is as follows.

Press a fully lit **ACCESS** key once to select a source - the key turns white. On DisplayDock, the "Source Parameters" page shows the source label and all of its parameters. On the surface, the rotary controls (1) and soft keys (2) within the Fader Module update. You can now use either the on-screen buttons or control surface to make adjustments. Deselect the **ACCESS** key to return the console to its normal mode of operation (**ACCESS** keys fully lit green).

Double-press a fully lit **ACCESS** key to activate strip assign - the key turns yellow. On DisplayDock, the "Source Assignment" buttons appear in place of the DOCK - touch a source button to make a new assignment. Alternatively, turn the rotary control (1) to scroll through the available sources - the options appear in the electronic display (2). Press the **TAKE** key to confirm your selection. The new source label appears in the Label display (6). Once you have assigned a source, the strip assign mode cancels and the console returns to its normal mode of operation (**ACCESS** keys fully lit green).

4 Fader

Use the fader to adjust the source's mix level to the summing bus outputs. The level can be adjusted from $-\infty$ to $+9\text{dB}$. Note that **PGM** buses are always fed post-fader, while **AUX** buses can be switched between pre- and post-fader.



5 Signal Present Indicator

The color of the backlight indicates whether signal is present at the input to the source. There are three possible states:

- **Off** (not lit) = input signal level < -40dBr.
- **Green** = input signal level > -40dBr.
- **Red** = input signal level > +6dBr.

Please see [System Reference Levels](#) to see how the dBr values equate to your system's operating levels.

6 Source Label

This display shows the name of the source assigned to the fader strip. Optionally, you can add two more lines of text by [editing](#) the user labels.

The size of the text can be customized by enabling (or disabling) the **LARGE USER LABELS** option in the [Advanced](#) page.

7 Channel ON/OFF & PFL

On a Fader Start console, the upper key turns the channel **ON** (or off); the lower key activates **PFL** (pre-fade listen).

On a Button Start console, the same keys turn the channel **ON** and **OFF**, and pre-fade listen (**CUE**) moves to the small soft keys described earlier (2).

When the channel "on" state is active, its post-fader signal feeds the summing bus outputs (as defined in [Bus Assign](#) mode). This allows you to quickly add (or remove) a channel from the PGM outputs.

The channel on/off operation differs in the following ways.

Fader Start Consoles

The fader motors are active and the channel "on" state is conditional on the fader position. This allows you to open and close a fader (and its audio) automatically from the **ON** key.

- To quickly turn on a channel, press the **ON** key - it lights in red and the fader opens to 0dB.
- To quickly turn off a channel, press the **ON** key again - the light goes out and the fader closes.
- To fade the level in or out, move the fader - the channel **ON** key indicates the on/off status.

Button Start Consoles

The fader motors are inactive and the channel "on" state is independent of the fader position. This allows you to prepare a level and then turn **ON** the channel's audio at a later stage.

- To quickly turn on a channel, first open the fader and then press the **ON** key - the channel turns on at the prepared level.
- To quickly turn off a channel, press the **OFF** key - the channel turns off but the fader remains open. This allows you to quickly start the channel again by pressing the **ON** key.
- To fade the level in, press **ON** and then open the fader.
- To fade the level out, press **ON** and close the fader - the **ON** key cancels and the **OFF** key lights. If you keep hold of the fader you can re-open the channel without having to prime the **ON** key again.

8.3 Source-Specific Functions

The four soft keys on each fader strip are labeled by the electronic display. Their default functions vary depending on the type of source and the console edition. The default functions for all source types are as follows.

Fader Start Consoles

| | MIC DJ | MIC 2 - 4 | HYBRID | CODEC | PLAYER | TONE |
|--------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| MF 1 | a b CONF | a b TB CONF | a b TB CONF | a b TB CONF | a b | a b 63 400 |
| Display | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD |
| MF 2 | a b AMix | a b AMix | a b TEL | a b | a b | a b 1kHz 12.5 |
| Fader | [Fader] | [Fader] | [Fader] | [Fader] | [Fader] | [Fader] |
| LAWO-Logo | Signal Present | Signal Present | Signal Present | Signal Present | Signal Present | Signal Present |
| Display name | ABCDEF | ABCDEF | ABCDEF | ABCDEF | ABCDEF | ABCDEF |
| MF 3 | ON | ON | ON | ON | ON | ON |
| MF 4 | PFL | PFL | PFL | PFL | PFL | PFL |

- **TB** - press this key to talk to the recipient (e.g. to the guest, hybrid or codec).
- **CONF** - enable this key to create a mix minus for the source. You must enable **CONF** on more than one source to activate the conference. The conference system is described in more detail [later](#).
- **TEL** - this key lights when a telephone call is incoming. Press the key to capture the call on the console.
- **AMix** - enable this key to add the source to the auto mix group. You must enable more than one **AMix** key to start auto mixing. The auto mix function adjusts the levels of all sources in the auto mix group.
- On the TONE source, the 4 small keys select the frequency of the tone: 63Hz, 400Hz, 1kHz or 12.5kHz.

Button Start Consoles

| | MIC DJ | MIC 2 - 4 | HYBRID | CODEC | PLAYER | TONE |
|--------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| MF 1 | a b CONF | a b TB CONF | a b TB CONF | a b TB CONF | a b | a b 63 400 |
| Display | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD | ABCD ABCD ABCD ABCD |
| MF 2 | a b CUE | a b CUE | a b TEL CUE | a b CUE | a b CUE | a b 1kHz 12.5 |
| Fader | [Fader] | [Fader] | [Fader] | [Fader] | [Fader] | [Fader] |
| LAWO-Logo | Signal Present | Signal Present | Signal Present | Signal Present | Signal Present | Signal Present |
| Display name | ABCDEF | ABCDEF | ABCDEF | ABCDEF | ABCDEF | ABCDEF |
| MF 3 | ON | ON | ON | ON | ON | ON |
| MF 4 | OFF | OFF | OFF | OFF | OFF | OFF |

The functions are the same as above except **AMix** is replaced by **CUE**:

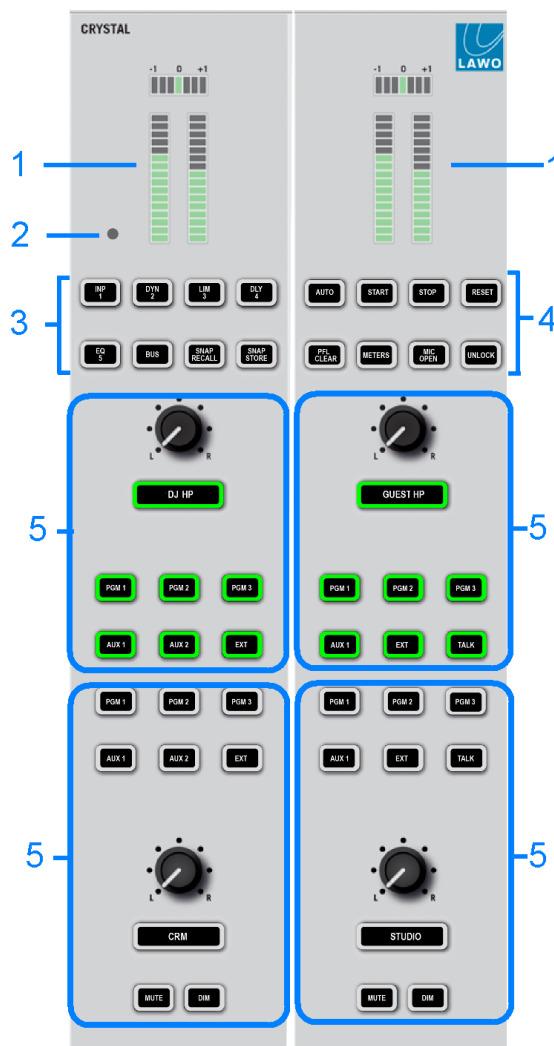
- **CUE** - press this key to cue a source pre-fader. See [PFL / CUE](#) for full details.

On a Button Start console you can enable or disable automix from the [Dynamics](#) source parameter controls.

8.4 The Central Modules

The two Central Modules provide access to global options and shortcuts, output metering and monitoring controls for the loudspeakers and headphones.

On a 4-fader surface there is only one Central Module. This means that functions from the second Central Module (on the right) must be controlled from DisplayDock.



1 Output Metering

The two stereo meters provide [output metering](#) for the follow monitor output (on the left) and PGM 1 output (on the right). The meters work in parallel with the meters on the DOCK.

2 Ambient Light Detector

This detector automatically adjusts the brightness of buttons and displays on the control surface according to the ambient light level. It can be enabled or disabled from the [Advanced](#) page.

3 Function Keys

The 8 function keys are dual engraved to perform the following functions:

[Source Parameter Control](#) – press **INP**, **DYN**, **LIM**, **DEL** or **EQ** to adjust parameters for the source in access.

[Bus Assign](#) – press **BUS** and then select a page (1 to 5) to map bus assignments onto the Fader Module.

[Local Snapshots](#) – press and hold **UNLOCK** + **SNAP RECALL** + a memory number (1 to 5) to recall settings from a local snapshot. **SNAP STORE** works in a similar manner.

4 Timer, PFL Clear, Meter, Mic Open & Unlock

The same keys on the second Central Module provide shortcuts to some common operations:

- **AUTO, START, STOP & RESET** - control the [Timer](#) on the DOCK.
- **PFL CLEAR** - cancel any active [PFL / CUE](#) selections.
- **METERS** - opens the [Metering](#) page on DisplayDock.
- **MIC OPEN** - is an indicator only. It lights in red whenever a MIC source fader is [open](#).
- **UNLOCK** - this key protects the **SNAP STORE** and **SNAP RECALL** keys on the Central Module and the **DEFAULT AUDIO** button for the local matrix. For more information, see [Using the Local Snapshot Memories](#) and [local matrix](#).

5 Monitoring Controls

The remaining keys and rotary controls provide monitor source selection and volume control for the four monitor outputs: Control Room (CR) and Studio loudspeakers, plus the DJ and Guest headphones.

In each case, the monitor sources are identical, allowing you to listen to any of the PGM or AUX buses or the external input (EXT). Additional monitor sources and other options will appear on the DisplayDock "Monitor Extender" when you press the wide keys below each of the rotary controls.

For the Control Room and Studio outputs, the **MUTE** and **DIM** keys allow you to quickly mute or dim the volume of the loudspeakers.

All of the monitoring functions are described in more detail [later](#).

8.5 Assigning Fader Strips

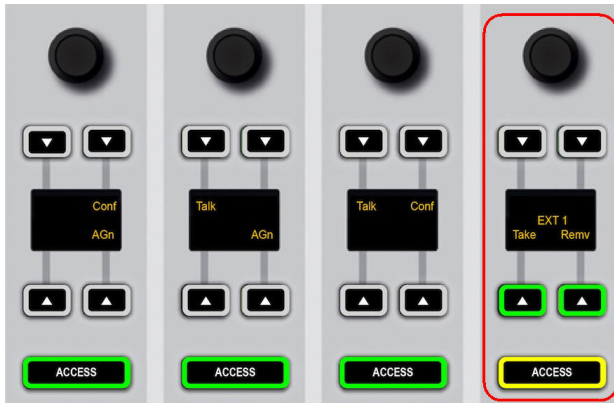
Any available source can be assigned to any fader strip. This allows you to choose which inputs/sources are active in the mix. Please note:

- A source cannot be assigned to more than one fader strip.
- A fader strip cannot be reassigned, or a source moved, if the fader is open (to prevent on-air sources being removed by accident).

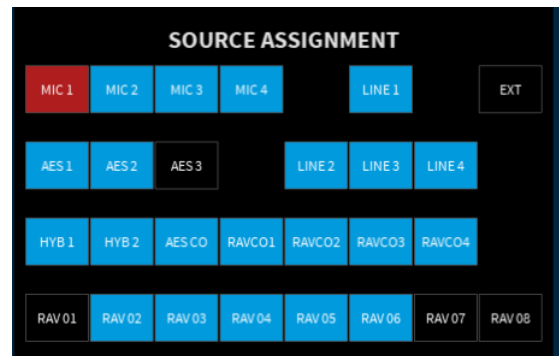
8.5.1 Assigning a Source to a Fader

1. Double-press an **ACCESS** key (it turns yellow) - the fader strip switches into "strip assign" mode, and the "Source Assignment" buttons appear on DisplayDock.

Fader Strips (source assign mode)



DisplayDock (source assign view)



Scroll down for more sources.

On DisplayDock, the buttons are color-coded to show the current status of each source:

- **Black** = source not assigned and available.
- **Blue** = source assigned and available (its fader is closed).
- **Red** = source assigned and NOT available (its fader is open).

If you choose a blue source, then it will move from its existing location to the fader strip in access.

You cannot choose a red source as it is deemed to be on-air. In this instance, first find the source on the surface and close its fader - the button color changes from red to blue, and the source can be selected.

2. Make the assignment using either the fader strip controls or DisplayDock:

➤ From the fader strip:

- Turn the rotary control to scroll through the available sources.
- Once you found the desired source, press **TAKE** to make the assignment - the fader label updates and the strip assign mode cancels.
- Alternatively, press **REMV** to remove the source - the fader strip is cleared and strip assign cancels.

➤ On DisplayDock:

- Select an available source (black or blue) to make the assignment - the fader label updates and the strip assign mode cancels.
- Alternatively, select **REMOVE** to remove the source - the fader strip is cleared and strip assign cancels.
- The **CANCEL** button cancels out of the strip assign mode without making any changes.

3. Once an assignment has been made, the console returns to its normal mode of operation: **ACCESS** keys green + **DOCK** in view.

➤ **Troubleshooting**

If you attempt to assign a source but nothing happens, check the following:

- Is the fader open on the strip you wish to assign? If so, you must close the fader.
- Is the source already assigned to a different fader strip and the fader open? If so, the source is deemed to be on-air, and so you must find the source and close its fader.

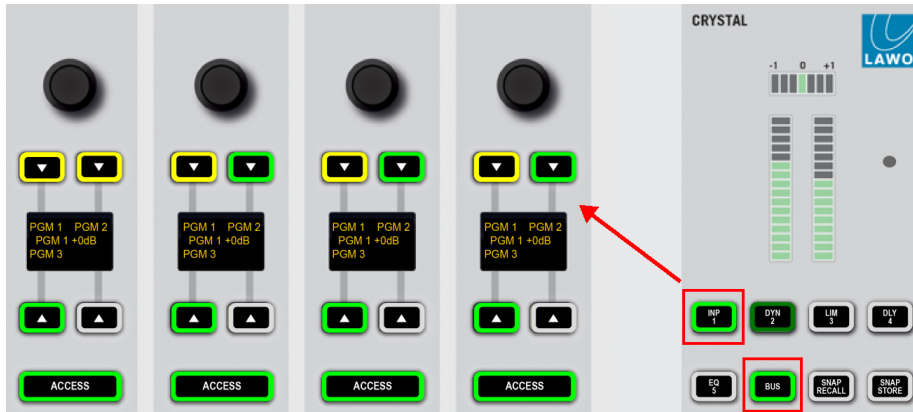
8.6 Bus Assign

Once a source is assigned to the surface, it can be routed to any of the stereo PGM and AUX outputs. The PGM buses are always fed post-fader. The AUX buses can be fed either pre or post fader, and have an independent send level. All post-fader assignments are affected by the fader level AND channel ON/OFF status.

8.6.1 Assigning a Source to a Bus

1. On the Central Module, press **BUS** and then a page number: e.g. **1** for PGM or **2** for AUX.

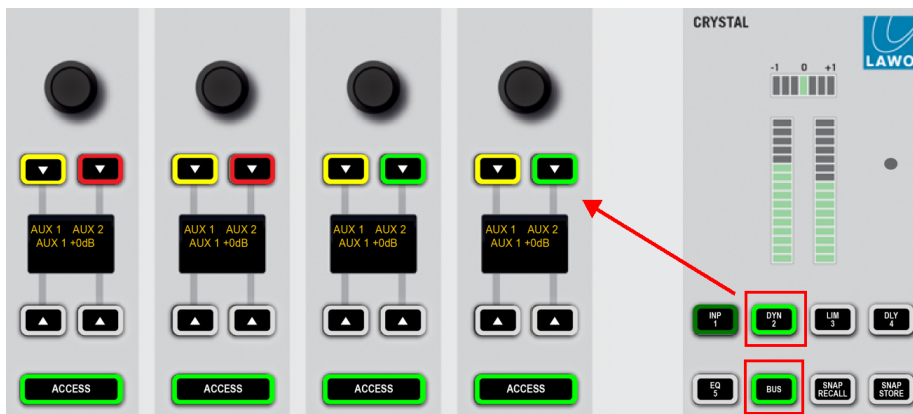
Fader Strips (PGM bus assign)



The fader strips switch into "bus assign" mode, and their soft keys show the current assignments:

- **Yellow** = post-fader.
 - **Green** = off (not assigned).
 - **Red** = pre-fader (available for AUX buses only).
2. Press a soft key to assign (or de-assign) the source from a bus - its color updates. Keep pressing to cycle through the available options.
 3. On the AUX page, you can also adjust the aux send level.

Fader Strips (AUX bus assign)



The display shows the level of the last AUX send adjusted. Tap down on the rotary control to access the alternate send. When the correct AUX is displayed, turn the control to adjust the level. Aux send levels can be adjusted from -120dB to +9dB.

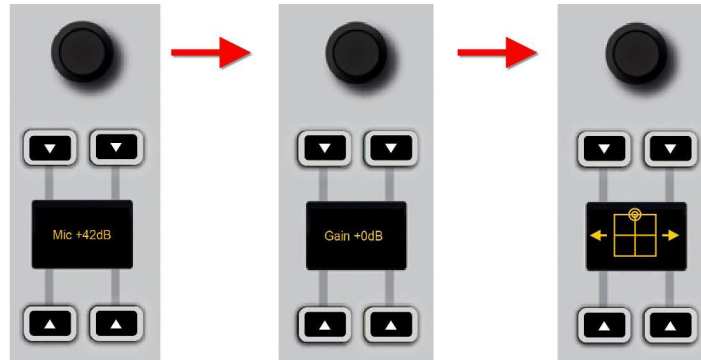
4. When you have finished editing the bus assignments, deselect **BUS** (on the Central Module) - the rotary controls and soft keys return to their default functions (described [earlier](#)).

8.6.2 Assigning a Bus to an Output

By default, the summing buses are assigned to a number of physical outputs and Tx streams. These are listed under [Default Audio Assignments](#).

8.7 Input Gain & Pan

Rotary Control Parameters (MIC source)



The quickest way to adjust input gain, or the left/right pan position, is to turn the fader strip rotary control.

For MIC sources, two separate input gains are available: **Mic** gain (in the analog mic preamp) and channel **Gain** (applied in the digital domain). For other sources, only channel **Gain** is available.

For a mono source, you will see left/right pan. For a stereo source, this changes to left/right balance.

1. Turn the rotary control to adjust the first parameter - you will see both its name (e.g. **Mic** gain) and value (e.g. **+42dB**).
2. Press down on the rotary control to step to the next parameter (e.g. channel **Gain**).
3. Press down again to reach the next parameter (e.g. left/right pan).
4. If you keep tapping down, then the sequence repeats. The available parameters for a mono MIC source are shown above.

To interrogate parameters without making a change, tap down on the rotary control without turning - the display will show the parameter and its current value.

For more information on gain ranges and other input parameters, please see [Input & Pan Parameters](#).

8.7.1 Using AutoGain

AutoGain is available for all of the MIC sources. When enabled, it sets the **Mic** gain automatically (in the analog preamp).

Mic gain cannot be adjusted manually while AutoGain is enabled.

The system works by measuring the incoming signal level over a period of 5 seconds. Using an average of that measurement, it then sets the mic gain value automatically. The mic gain will then remain at the same value, until either a different value is loaded by a snapshot or AutoGain is turned off.

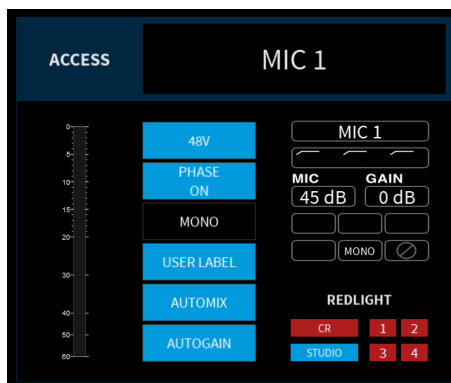
Please note:

- The gain adjustment happens automatically and so it is best to enable AutoGain *BEFORE* the channel goes on-air. Otherwise the signal may distort while AutoGain finds the ideal level.
- To use the system effectively you will need to ask the talent to speak into the microphone at their intended "on-air" level.

1. Start by asking the talent to speak and then turn on AutoGain by pressing the MIC source **ACCESS** key and enabling **AUTOGAIN**.

You can do this either by pressing the **AGn** soft key (on the MIC source fader strip), or pressing the MIC source **ACCESS** key and selecting **AUTOGAIN** (on DisplayDock):

DisplayDock Input Parameters



The measurement now takes place and the AutoGain value is adjusted. During this time, the **AUTOGAIN** button flashes in red to indicate that automatic gain adjustment is in progress. If the channel is turned ON, then you will hear the gain changing.

2. Once the process is complete, the **AUTOGAIN** button change to static red.

AutoGain is now set and enabled, ready for your talent to speak on-air.

3. To turn off AutoGain, press the **AUTOGAIN** button again - the button changes color (blue = off).

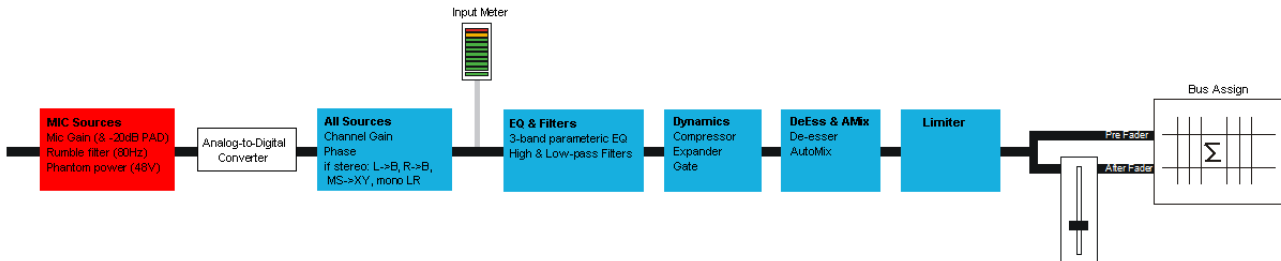
The mic gain now reverts to its previous value (before AutoGain was enabled), and [MIC gain](#) can be adjusted manually.

8.8 DSP Parameters

The remaining source parameters can be adjusted by selecting a source.

8.8.1 Signal Flow

MIC Source Signal Flow



The DSP available for each source is defined by the configuration and cannot be changed by the user.

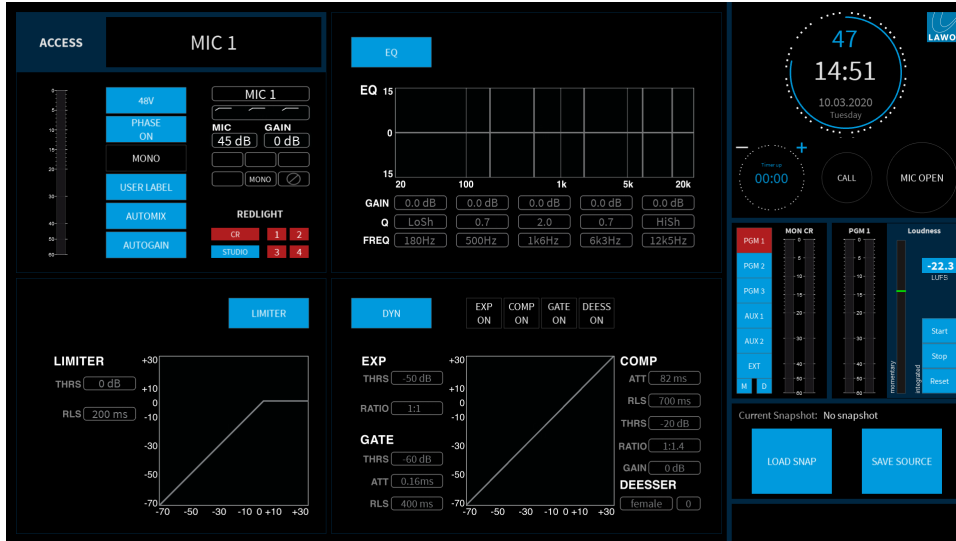
Each of the MIC sources comes fully-configured with analog and digital input sections; input meter; EQ & Filters; Dynamics (Compressor, Expander and Gate); De-Esser & AutoMix; and a Limiter. Other sources support a subset of these parameters.

8.8.2 Adjusting Source Parameters

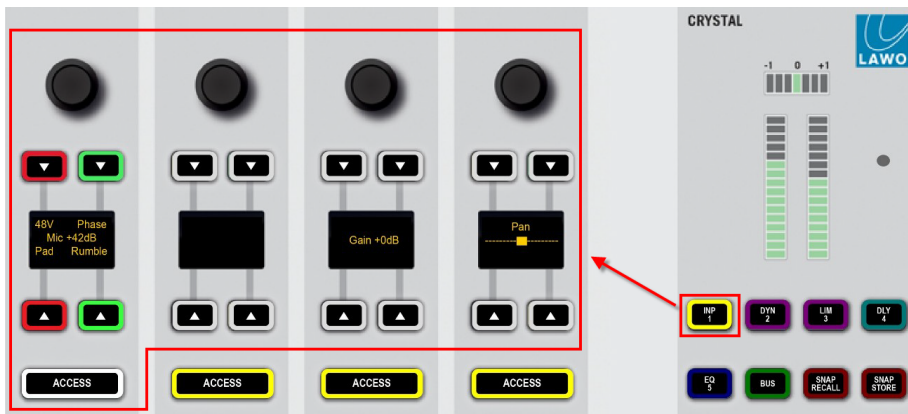
1. Select the source you wish to work on by pressing its fader strip **ACCESS** key - the key turns white.

The fader strip soft keys and rotary controls switch into "parameter control" mode, and on DisplayDock the "Source Parameters" page appears:

DisplayDock (Source Parameters page)



Control Surface (INPUT parameters)

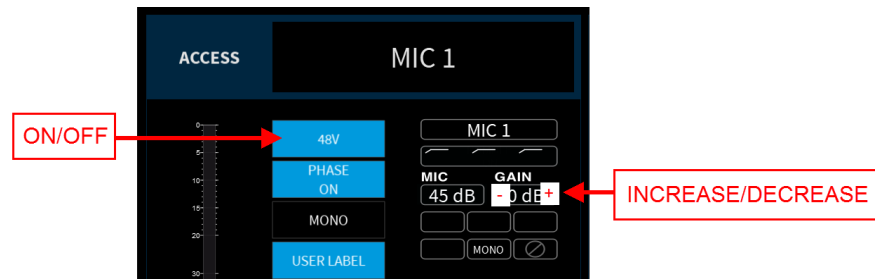


DisplayDock shows all available parameters, and so this is the best way to get an overview of a source.

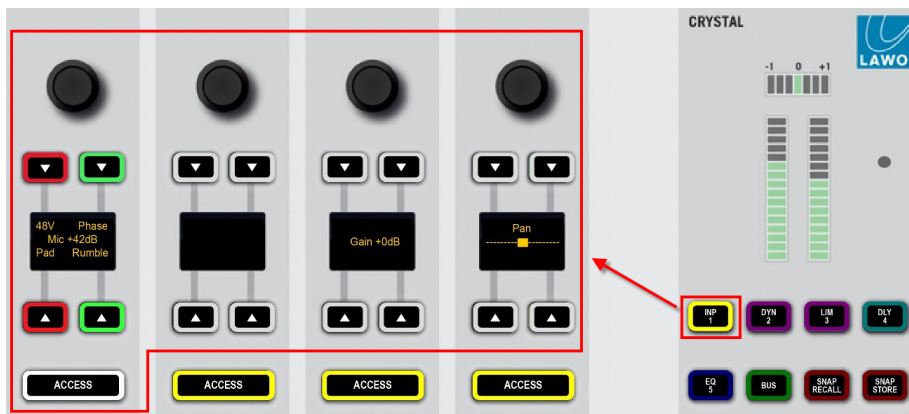
The surface controls are paged through different parameter sets using the **INP**, **DYN**, **LIM**, **DLY** and **EQ** keys on the Central Module. Note that the rotary controls and soft keys across all 4 fader strips are utilised when working in this mode.

8. Operation

2. DisplayDock is often the quickest way to make a simple change:



- For switched parameters, such as **48V**, touch the button to turn the option on or off: red = on; blue = off.
 - For variable parameters, such as GAIN, you can use the hidden + and - buttons behind the value fields to increase or decrease the value.
3. Alternatively, use the surface controls as follows.



- First, choose the parameters you wish to adjust by selecting a function key on the Central Module. For example, press **INP** to adjust the input and pan parameters for the selected source. The 16 soft keys and 4 rotary controls update, and are labeled by the displays (as shown above).
- Then press a soft key (e.g. **Pad**), to turn the option on or off: red = on; green = off.
- Turn a rotary control (e.g. **Mic**) to adjust its value - the current value (e.g. **+42dB**) is shown in the display.

Not all DSP modules are supported by all sources, and so some function keys may be unlit.

The color coding of the "off" **ACCESS** keys (within the 4-fader module) indicate the current function set - so yellow for INP parameters, magenta for DYN parameters, and so on.

4. At any time you can press **ACCESS** on a different fader strip to adjust the parameters for another source.
5. When you have finished adjusting the parameters, deselect the **ACCESS** key - the fader strip soft keys and rotary controls return to their default functions (described [earlier](#)), and the DisplayDock "Source Parameters" page closes.

The next few topics describe the source parameters in more detail.

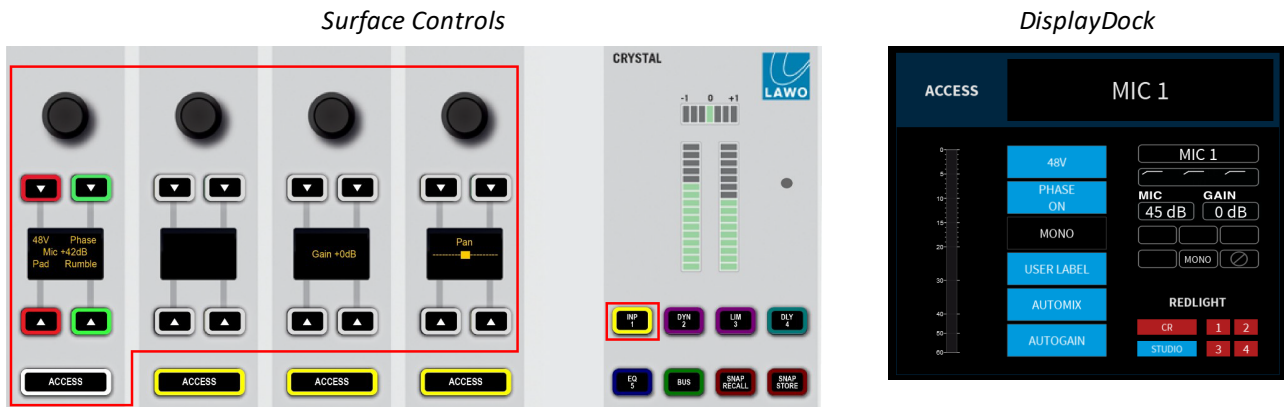
8.8.3 Input & Pan Parameters

Input and pan parameters are available for all sources. The exact parameters depend on the format of the source (mono or stereo), and how it is connected (via a mic preamp or line/digital).

➤ To access input and pan parameters, press an **ACCESS** key followed by **INP** on the Central Module.

When adjusting input gain, use the input meter (on DisplayDock) to help set a good input level. If the meter (or signal present indicator on the fader strip) turns red repeatedly, then the input level is overloading and you should reduce the Mic gain (or channel Gain) value.

MIC Sources



For a mono MIC source, you can adjust input parameters in the analog domain (before the A-D converter) AND in the digital domain (after the converter).

The analog (mic preamp) section includes:

- **MIC** - mic preamp gain from . See also [AutoGain](#).
- **48V** - 48V phantom power.
- **PAD** - 20dB PAD (reduces the mic gain by 20dB). When the PAD is active, the **MIC** gain value updates accordingly.
- **RUMBLE** - a high pass 'rumble' filter to roll-off subsonic frequencies.

In the digital domain, you can also adjust:

- **PHASE** - phase reverse.
- **GAIN** - channel gain from -30dB to +18dB.
- **PAN** - left/right panning onto the stereo buses. (This parameter is not shown on DisplayDock).

MIC gain, channel **GAIN** and **PAN** can also be adjusted from the fader strip rotary control (as described [earlier](#)).

HYBRID Sources

For a mono HYBRID source, only the digital domain parameters apply and so you can adjust **PHASE** reverse, channel **GAIN** and left/right **PAN**.

Stereo Sources



For stereo sources (LINE, AES, RAV, etc.), there are several additional parameters to deal with changes to the incoming audio. For example, if signal is not present at the right input, you can turn on **L->B** (Left to Both). Or, you can change the stereo input mode (from XY to MS) to decode an incoming Middle and Side signal. All parameters are applied in the digital domain.

The complete parameter list is as follows:

- **PHASE** - phase reverse for the left input.
- **STEREO** or **MS-XY** - changes the mode of operation from normal stereo to MS->XY decoding. (On the fader strips, turn the second rotary control from the left to change the mode.)
- **L->B** – the left input is routed to both sides of the stereo channel.
- **R->B** – the right input is routed to both sides of the stereo channel.
- **MONO** – left and right inputs are summed with a -3dB gain offset.
- **SIDE** – the left input and right input are reversed (left input to right side of channel, and right input to left side of channel).
- **GAIN** - channel gain from -30dB to +18dB.
- **BASIS** - left/right width. (On the fader strips, push down and turn the rotary control to adjust **BASIS**).
- **BAL** - left/right balance onto the stereo PGM and AUX buses. (This parameter is not shown on DisplayDock).

MS Decode

M/S is a stereo recording technique which uses two coincident microphones, one pointing to the front (Middle) and the other (bi-directional) at right angles to provide the stereo ambience (Side). The crystal system provides M-S to X-Y decoding to turn a Middle and Side signal into normal Left and Right stereo.

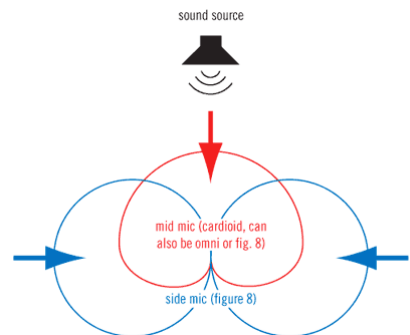
The incoming MS signal should be connected to a stereo source:

- Left Input - from the Middle (M) signal.
- Right Input - from the Side (S) signal.

When the **MS** stereo mode is active, the following calculations are applied:

- Left channel = L+R (M+S)
- Right channel = L-R (M-S)

By adjusting the **BALANCE** control, you can vary the ratio of Middle to Side, and thereby adjust the width of the stereo field.



8.8.4 Redlight



The "REDLIGHT" options apply to all MIC sources. They determine which MIC sources will trigger the red light in the control room (CR) and which will trigger the red light in the studio. In both cases, the red light will illuminate whenever the corresponding MIC fader is open. The options allow you to configure the logic differently depending on whether both red lights are needed, and how the four microphones are being used.

➤ To access the parameters, press an **ACCESS** key on any MIC source - on DisplayDock the "Source Parameters" page appears.

From the "REDLIGHT" area:

1. First choose a red light, either **CR** or **STUDIO** - the selection turns red.
2. Then assign the MIC sources using the numbered buttons: red = assigned, blue = not assigned.

Note that the selections are mutually exclusive, and so if you remove MIC 1 from the CR, it will be assigned automatically to the STUDIO.

To support the red light functionality, the GPIO connector must be correctly wired as GPOs 1 and 2 output the red light status. See [GPIO functions](#) and Connector Pin-Outs.

Whenever the CR red light is active, the control room speakers will automatically mute (to prevent feedback from an open MIC).

You can bypass this functionality by assigning the MIC source to the STUDIO red light.

8.8.5 Dynamics

Dynamics parameters are available for all MIC sources and some of the other sources.

To check if dynamics is supported, press the source's **ACCESS** key and then look at DisplayDock - if the Dynamics graph (and parameters) appear, then the DSP is available. Alternatively, look at the Central Module: **DYN** key lit = dynamics available.

The dynamics DSP provides an independent compressor, expander and gate. For the four MIC sources, a de-esser and automix are also available.

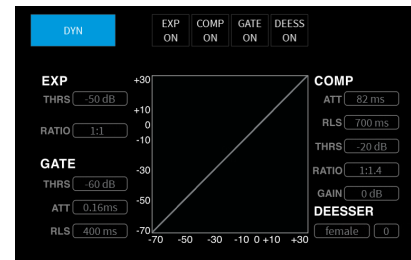
➤ To access the dynamics parameters, press an **ACCESS** key followed by **DYN** on the Central Module.

The fader strip controls update to show the last page adjusted - in our example, the Compressor:

Surface Controls (Compressor)



DisplayDock



- Press down on the left (master) rotary control to cycle through the available pages: Compressor, Expander, Gate and De-Esser/AutoMix (if available).
- Keep pressing to return to the Compressor (page 1).

The Dynamics graph on DisplayDock includes a green ball which represents the output level of the complete Dynamics section: Compressor, Expander and Gate. This changes dynamically as the signal level varies, and so is extremely helpful when adjusting parameters.

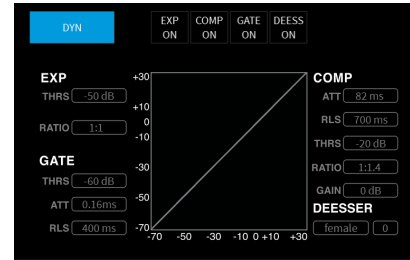
If a red ball is also visible, then this represents the output level of the De-Esser.

Compressor

Surface Controls (Compressor)



DisplayDock



The following parameters are available for the compressor:

- **DYN** - on/off for *all* dynamics sections: compressor, expander, gate (and de-esser/automix).
- **COMP** - on/off for the compressor.
- **GAIN** - makeup gain from -12dB to 0dB.
- **THRS** - threshold from -93dB to +27dB.
- **RATIO** - ratio from 1:1 to 1:16
- **ATT** - attack time from 0.16ms to 82ms.
- **RLS** - release time from 10ms to 5000ms.

For the ATT/RLS control, turn to adjust the attack time, and then press down and turn to adjust the release time.

Both **DYN** and **COMP** *must* be enabled (red) for the compressor to be active. This is best checked by looking at DisplayDock (where you can see the **DYN** button plus on/off for the individual sections: COMP, EXP, GATE, etc.)

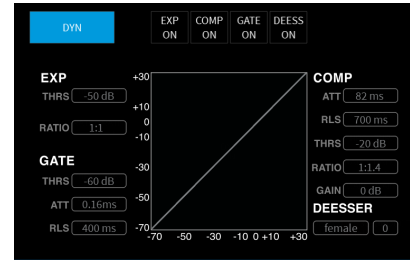
The characteristic of the compressor is optimized for radio on-air operation. The ratio pivot point moves around the working point according to the input signal level and not around a fixed threshold. This allows the ratio to adapt without having to change the level considerably.

Expander

Surface Controls (Expander)



DisplayDock



The following parameters are available for the expander:

- **DYN** - on/off for *all* dynamics sections: compressor, expander, gate (and de-esser/automix).
- **EXP** - on/off for the expander.
- **THRS** - threshold from -93dB to +27dB.
- **RATIO** - ratio from 1:1 to 1:0.1.

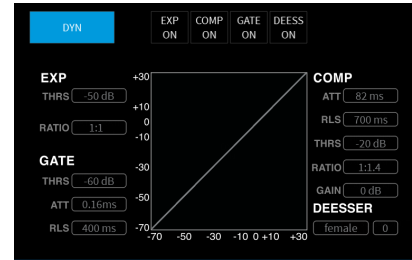
Both **DYN** and **EXP** *must* be enabled (red) for the expander to be active. This is best checked by looking at DisplayDock (where you can see the **DYN** button plus on/off for the individual sections: COMP, EXP, GATE, etc.)

Gate

Surface Controls (Gate)



DisplayDock



The following parameters are available for the gate:

- **DYN** - on/off for *all* dynamics sections: compressor, expander, gate (and de-esser/automix).
- **GATE** - on/off for the gate.
- **THRS** - threshold from -93dB to +27dB.
- **ATT** - attack time from 0.16ms to 82ms.
- **RLS** - release time from 10ms to 5000ms.

For the ATT/RLS control, turn to adjust the attack time, and then press down and turn to adjust the release time.

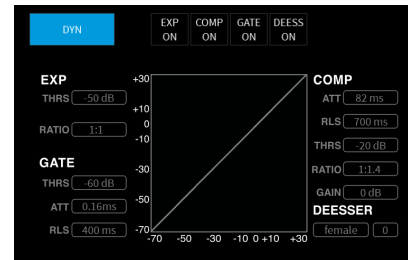
Both **DYN** and **GATE** *must* be enabled (red) for the expander to be active. This is best checked by looking at DisplayDock (where you can see the **DYN** button plus on/off for the individual sections: COMP, EXP, GATE, etc.)

De-Esser

Surface Controls (DeEsser & AutoMix)



DisplayDock



A de-esser is available for all MIC sources and can be used to reduce excessive sibilance when dealing with human speech.

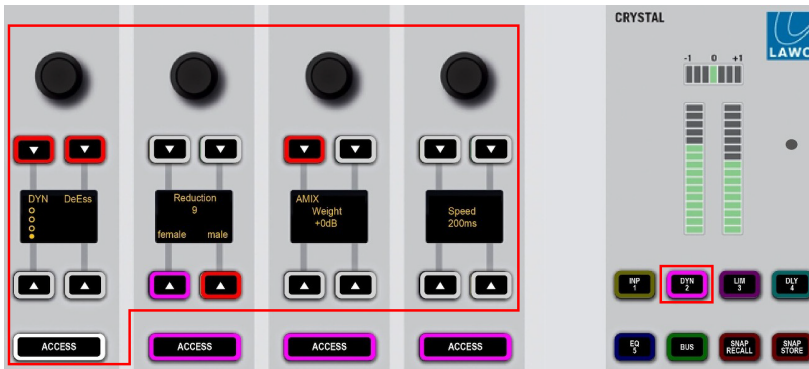
The following parameters are available for the de-esser:

- **DYN** - on/off for *all* dynamics sections: compressor, expander, gate and de-esser/automix.
- **DeEss** - on/off for the de-esser.
- **Reduction** – this is the amount of gain reduction applied to the sibilant frequencies:
 - Values from 1 to 6 reduce the gain of the unwanted sibilant frequencies; the higher the value, the more gain reduction.
 - Above 6, the gain reduction remains at its maximum, and the affected frequency range broadens.
- **female/male** – select **female** or **male** to change the center frequencies affected by the de-esser; these are optimised for either male or female voices.

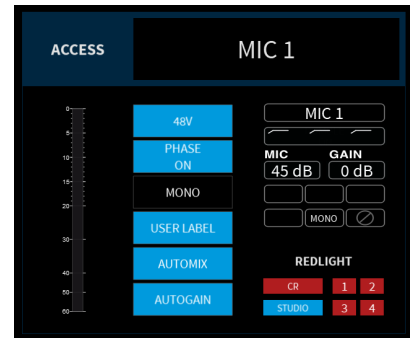
Both **DYN** and **DeEss** *must* be enabled (red) for the de-esser to be active. This is best checked by looking at DisplayDock (where you can see the **DYN** button plus on/off for the individual sections: COMP, EXP, GATE, etc.)

AutoMix

Surface Controls (DeEsser & AutoMix)



DisplayDock



AutoMix is available for all MIC sources. The feature is ideal for balancing active and inactive microphones such as in a panel discussion, or creating an automated voice-over.

Once AutoMix is enabled on more than one source, an internal algorithm monitors the signal power of each channel, and then automatically adjusts the mix levels accordingly. For example, if there are three guests plus the DJ, then the algorithm will automatically mute the guest sources while the DJ is speaking, and so on.

AutoMix can be enabled (and disabled) from the fader strip (via the **AMix** soft key) or from DisplayDock (via the **AUTOMIX** button). All other parameters are available from the fader strip only as follows:

The following parameters are available for AutoMix:

- **DYN** - on/off for *all* dynamics sections: compressor, expander, gate and de-esser/automixing.
- **AMix** - on/off for AutoMix.
- **Weight** - adjusts the weighting factor of each source from +9 to -9 with a default mid point = 0. Sources with a higher weight value get priority in the mix; those with the same weight are mixed equally; and those with a lower value get reduced priority.

For example, in a panel discussion you might want to give the host leading the discussion a higher weight value than that of the guests. Or, to create an automated voice-over, adjust the weight of the playout material to a much lower value than that of the voice.

- **Speed** – the speed adjusts the "smoothness" of the AutoMix, and is set in milliseconds (ms).

The speed defines how quickly a signal returns to its normal mix level after its gain has been suppressed. A short speed fades signals in and out quickly, but could result in "pumping" if several guests are talking in parallel. A longer speed will be smoother but may generate audible fades in and out. The ideal value depends on the material.

Both **DYN** and **AMix** *must* be enabled (red) for AutoMix to be active. If the master **DYN** button is not enabled, then the **AMix** button is dim to indicate that AutoMix is not yet active.

8.8.6 Limiter

A separate limiter is available for all MIC sources and some of the other sources.

To check if the limiter is supported, press the source's **ACCESS** key and then look at DisplayDock - if the Limiter graphs (and parameters) appear, then the DSP is available. Alternatively, look at the Central Module: **LIM** key lit = limiter available.

➤ To access the limiter parameters, press an **ACCESS** key followed by **LIM** on the Central Module.



The following parameters are available for the Limiter:

- **LIM** - on/off for the limiter: red = on.
- **THRS** - threshold from -93dB to +27dB.
- **RLS** - release time from 10ms to 5000ms.

The Limiter graph on DisplayDock includes a green ball which represents the output level of the Limiter. This changes dynamically as the signal level varies, and so is extremely helpful when adjusting parameters.

8.8.7 Delay

Delay is not supported by any source in the crystal standard configuration. Therefore, the **DLY** key on the Central Module has no function.

8.8.8 EQ

EQ parameters are available for all four MIC sources and some of the other sources.

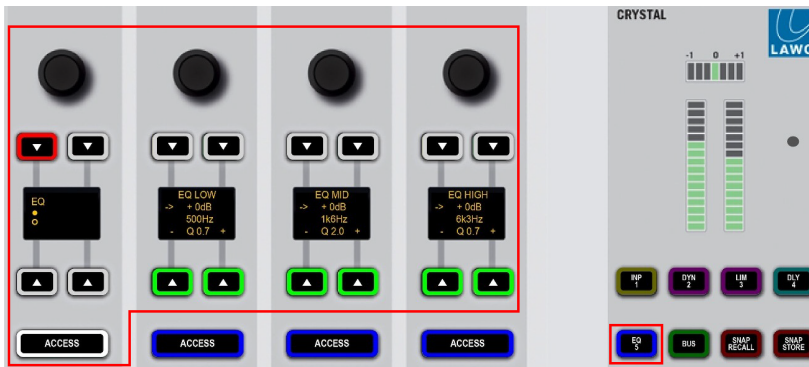
To check if EQ is supported, press the source's **ACCESS** key and then look at DisplayDock - if the EQ graph (and parameters) appear, then the DSP is available. Alternatively, look at the Central Module: **EQ** key lit = dynamics available.

The EQ provides a 3-band parametric EQ plus high-pass and low-pass filters. The filters can be used either as fixed slope filters (12dB per octave) or shelving EQ.

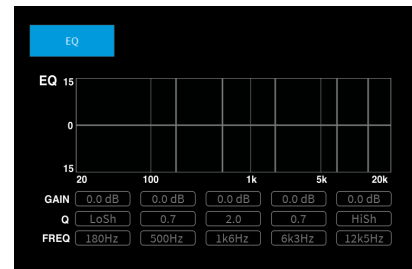
➤ To access the EQ parameters, press an **ACCESS** key followed by **EQ** on the Central Module.

The fader strip controls update to show the last page adjusted - in our example, the 3-band equalizer:

Surface Controls (3-band EQ)



DisplayDock

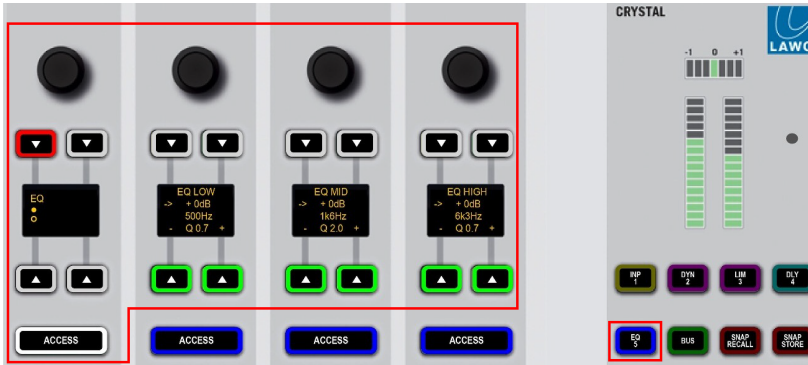


- Press down on the left (master) rotary control to access the second page (for the 2-band Filters).
- Press again to return to the 3-band parametric EQ (page 1).

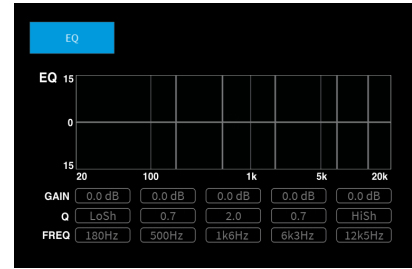
The EQ graph on DisplayDock shows all five bands of EQ simultaneously. This provides a great overview of the complete section.

3-band Parametric Equalizer

Surface Controls (3-band EQ)



DisplayDock



For the 3-band parametric EQ, each band can be adjusted separately using the three sets of controls: EQ LOW, EQ MID and EQ HIGH.

For each band, the following parameters are available:

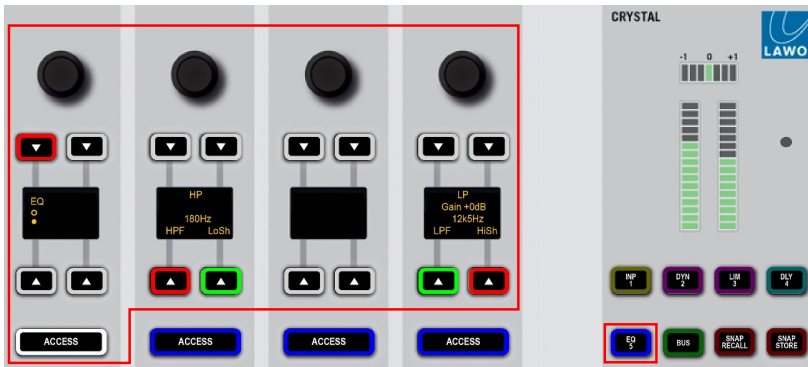
- **Gain: Low, Mid and High** - Gain can be adjusted from -15dB to +15dB.
- **Frequency: Low, Mid and High** - Frequency can be adjusted from 20Hz to 18kHz.
- **Q** - press the + or – buttons to increase or decrease the **Q** for each band. Q can be adjusted from 0.7 to 5.0.

For the GAIN/FREQ control, turn to adjust the Gain, and then press down and turn to adjust Frequency.

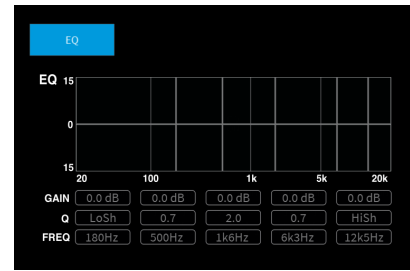
The **EQ** button acts as the master on/off for the complete section: 3-band parametric EQ + 2-band filters.

2-band Filters

Surface Controls (Filters)



DisplayDock



For the 2-band filters, each band can operate either as a fixed slope filter or as a shelving EQ:

- On the **HP** filter band, select either **HPF** to choose a high-pass filter, or **LoSh** to choose a low frequency shelf.
- On the **LP** filter band, select either **LPF** to choose a low-pass filter, or **HiSh** to choose a high frequency shelf.

High (or Low) Pass Filters

In this mode the filter slope is fixed (at 12dB per octave). Therefore, there is no Gain or Q value available. The cut-off frequency can be adjusted from 20Hz to 18kHz.

High (or Low) Shelving EQ

In this mode, the following parameters are available:

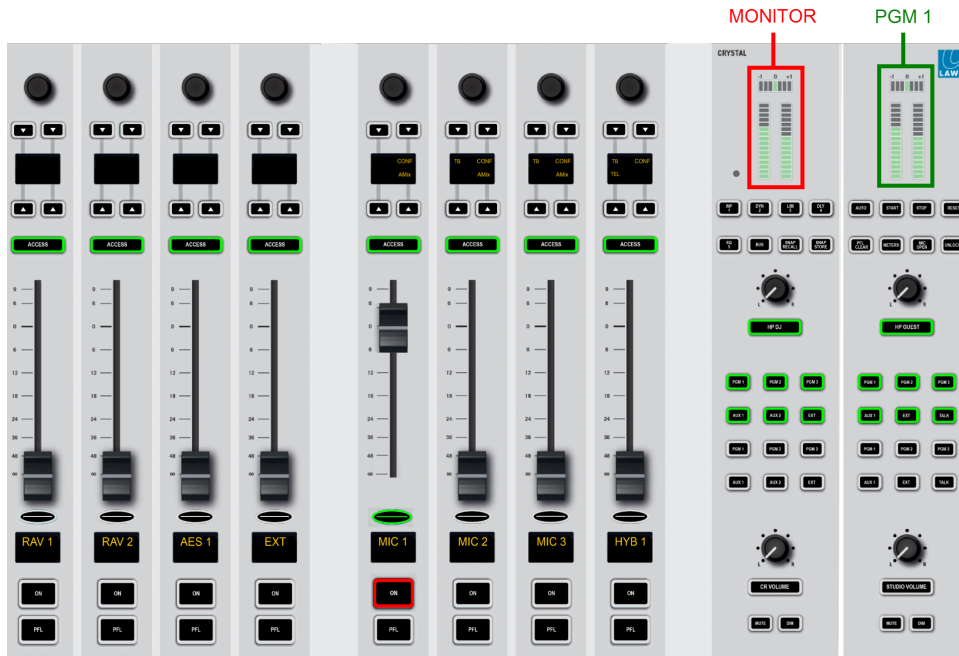
- **Gain: LoSh and HiSh** - Gain can be adjusted from -15dB to +15dB.
- **Frequency: LoSh and HiSh** - Frequency can be adjusted from 20Hz to 18kHz.

For the GAIN/FREQ control, turn to adjust the Gain, and then press down and turn to adjust Frequency.

The **EQ** button acts as the master on/off for the complete section: 3-band parametric EQ + 2-band filters.

8.9 Metering

8.9.1 Output Metering



DisplayDock and the Central Modules include two output meters: follow MONITOR and PGM 1:

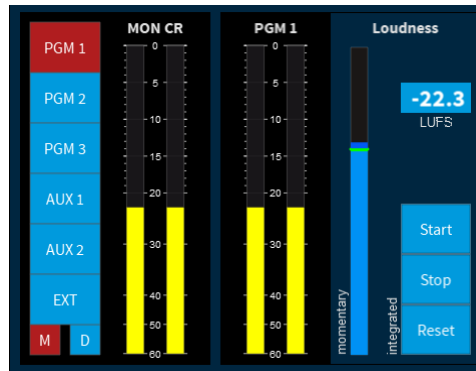
- **MONITOR** - meters the Control Room monitor source, before the CR volume and mute/dim. If a **PFL / CUE** button is active, then the meter automatically switches to the pre-fader listen bus level. It will return to the active monitor source once all PFL / CUE selections are cleared.
- **PGM 1** - *always* meters the PGM 1 output.

Both meters are stereo PPMs (Peak Program Meters) and use a digital scale relative to 0dBFS.

On the control surface, each meter is accompanied by a stereo correlation meter. On DisplayDock, you also have loudness metering for PGM 1. On a 4-fader console, there is no second Central Module and so the PGM 1 meter appears on DisplayDock only.

8.9.2 Loudness Metering (for PGM 1)

DisplayDock (Monitoring & Metering)



On DisplayDock, there are two loudness measurements: momentary and integrated which conform to the ITU-R BS1770.

Momentary Loudness (Bargraph)

The blue bargraph represents the average energy of the summed component channels: left and right. The average is measured using either a Momentary (400ms sliding window) or Short term (3s sliding window) integration time.

The color indicates whether loudness is above or below the Target Level:

- **Light Blue** = equal to, or below, the Target Level.
- **Dark Blue** = above the Target Level.

Scale markers indicate a tolerance of +/- 1 LU/LK.

Integrated Loudness Measurement (in LUFS)

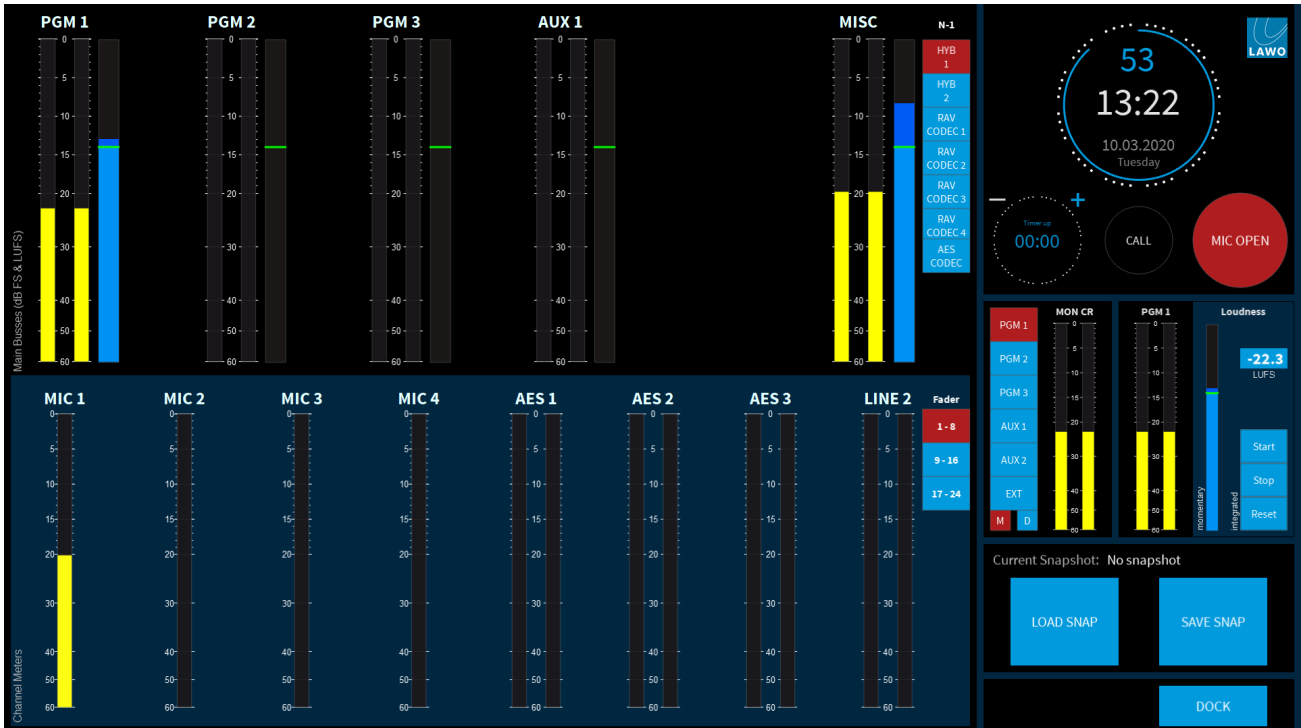
The integrated loudness measurement is controlled by the on-screen **Start**, **Stop** and **Reset** buttons. It is very useful for measuring loudness over a longer period - for example, for the duration of the show.

The measurement is displayed in LUFS (Loudness Units Full Scale).

8.9.3 The METERING Page

Other signals can be metered by pressing the **METERING** button (on the DOCK):

DisplayDock Metering page



The page is divided into two rows to meter outputs (at the top) and inputs (at the bottom). All of the PPMs are dynamic Peak Program Meters and use a digital scale relative to 0dBFS. The output meters include momentary loudness metering (as described [earlier](#)).

Output Metering

On the top row are meters for the summing buses: **PGM 1**, **PGM 2**, **PGM 3** and **AUX 1**. Note that a dedicated meter for **AUX 2** is not available but it can be metered on the follow MONITOR meter by selecting the AUX as the CR monitor source.

The **MISC** meter is switched using the on-screen "N-1" buttons. It can meter any of the N-1 outputs: for Hybrid 1&2, RAVENNA Codec 1 to 4 or the AES Codec.

Input Metering

On the bottom row are 8 meters which are switched using the on-screen "Fader" buttons. This allows you to meter up to 24 faders (for a maximum size surface).

8.10 Monitoring & Talkback

crystal standard configuration supports four stereo monitoring outputs:

- MON CR - for the control room speakers.
- MON STUDIO - for the studio speakers.
- MON DJ - for the DJ headphones.
- MON GUEST - for the guest headphones.

In each case, the monitor sources are identical, and so the only real differences between the sections are the dedicated **MUTE** and **DIM** buttons (on the surface) for the speaker outputs; the split headphones option available for the MON DJ; and the automatic dimming of the MON CR output by an active [redlight](#).

If PFL (or CUE) buttons are active, the PFL bus is switched automatically to the MON CR and MON DJ outputs.

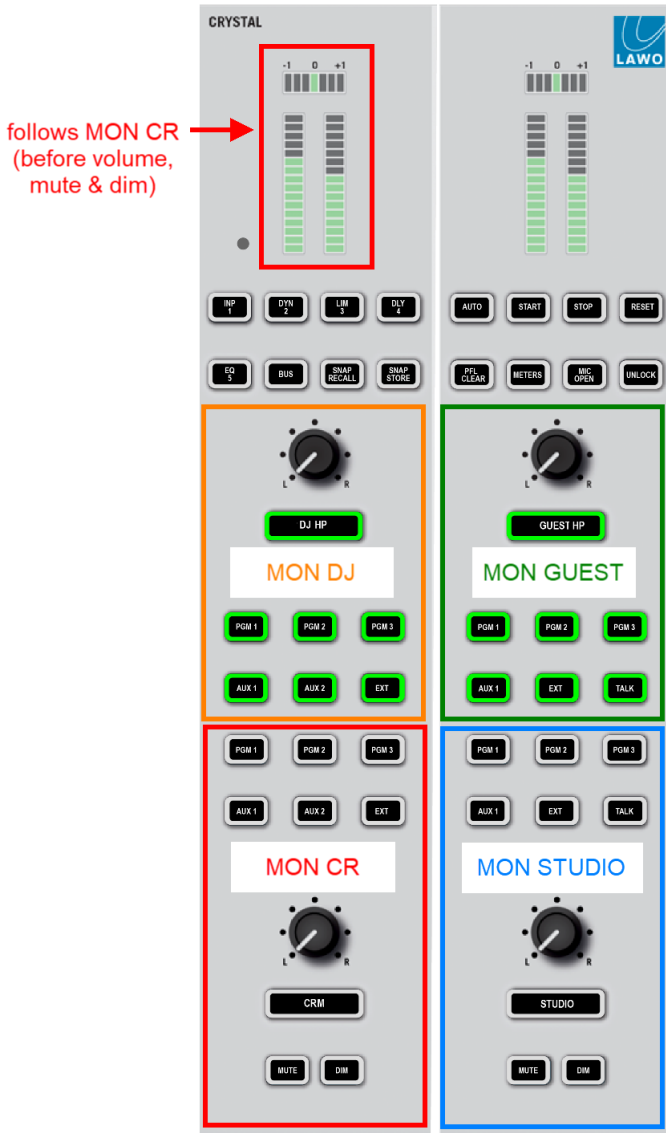
8.10.1 Default Audio Assignments

The default audio assignments are as follows. These can be edited from the [local matrix](#).

| Monitor Section | Local Matrix Output | Connector Location | Channel Numbers |
|-----------------|---------------------|--------------------|-----------------|
| MON CR | LINE 4 | LINE OUTPUT (rear) | Outputs 7&8 |
| MON STUDIO | LINE 3 | LINE OUTPUT (rear) | Outputs 5&6 |
| MON DJ | HP 1 | HEADPHONE 1 | n/a |
| MON GUEST | HP 2 | HEADPHONE 2 | n/a |

8.10.2 Monitoring Controls (on the Surface)

Central Modules (Monitoring Functions)



For each section, the monitor sources are identical, and can be selected independently so that you can listen to say PGM 1 on the DJ headphones while sending PGM 3 to the guest phones.

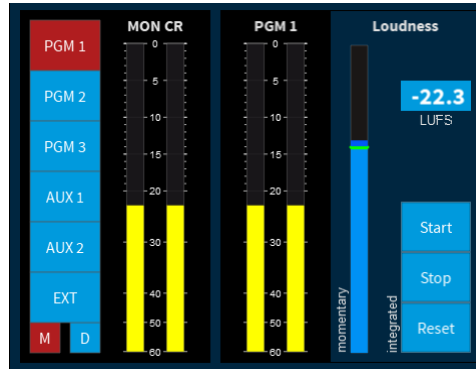
Six monitor sources can be selected directly from the surface: PGM 1, PGM 2, PGM 3, AUX 1, AUX 2 or EXT (the external input). Additional monitor sources, and other options, are then available via the "Monitor Extension" pop-ups on DisplayDock. These can be opened by pressing any of the wide buttons below the volume controls - e.g. press **CRM** to open the extension for the Control Room speakers; press **DJ HP** to open the extension for the DJ's Headphones; and so on. The additional functions are described [later](#).

In each case, turn the rotary controls to adjust the monitor volume. For the CRM and STUDIO outputs, the **MUTE** and **DIM** keys allow you to quickly mute or dim the volume of the loudspeakers.

The stereo PPM on the first Central Module follows the MON CR source selector. The meter shows the level *before* the Volume, Mute and Dim.

8.10.3 Monitoring Controls (on DisplayDock)

DisplayDock (Monitoring & Metering)



On DisplayDock, the buttons to the left of the MON CR meter work in parallel with the controls on the Central Module. You can use these to change the monitor source, or mute (M) and dim (D) the control room monitor output.

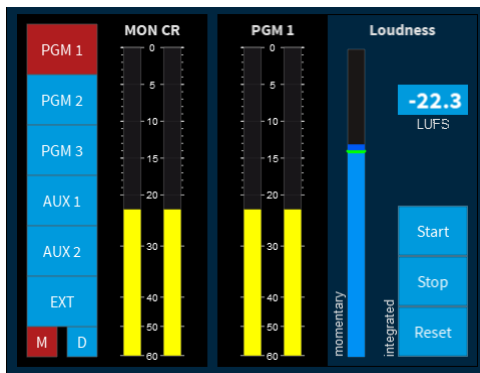
8.10.4 Using the Monitor Extensions

To access additional monitor sources, and other options, DisplayDock supports a "Monitor Extension" for each of the monitor sections.

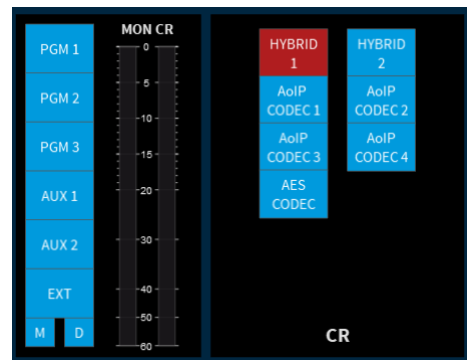
To open an extension, press the wide button below the section's volume control. For example, press **CRM** to open the extension for the Control Room speakers; press **DJ HP** to open the extension for the DJ's Headphones; and so on.

The extension will replace the PGM 1 metering and loudness controls, and be clearly labeled (e.g. CR for control room):

DOCK (default)



DOCK (with MON CR Extension)

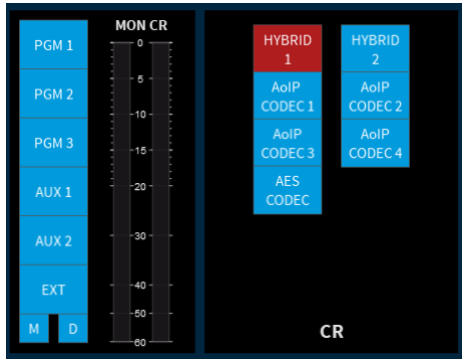


To close an extension, turn off its activation button - the DOCK returns to its default state (with PGM 1 metering).

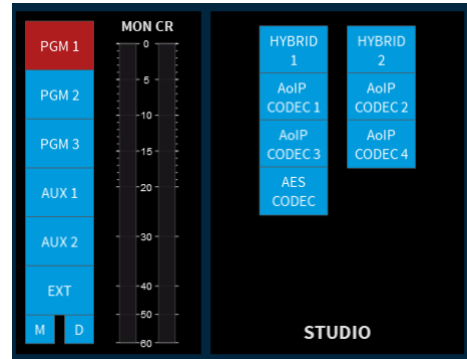
8.10.5 Monitor Extension Options

The extensions offer additional monitor sources such as the HYBRIDs and CODECs. If a monitor source is active, then its button lights in red.

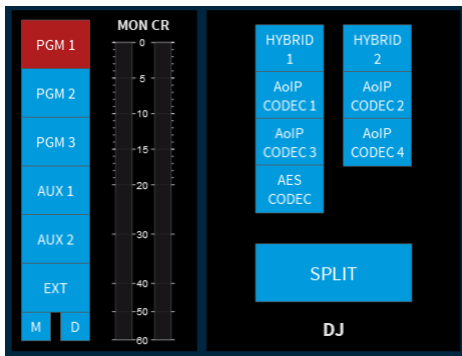
MON CR Extension



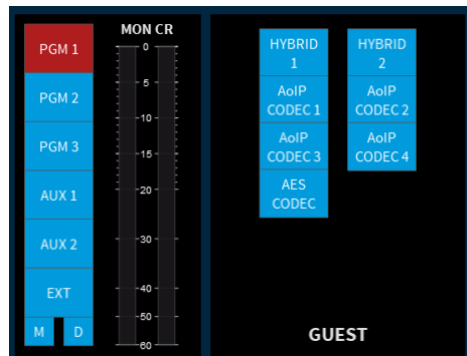
MON STUDIO Extension



MON DJ Extension



MON GUEST Extension



Split Headphones

There is one additional option for MON DJ output called **SPLIT**.

When **SPLIT** is active (red), the DJ will hear different signals in the left and right ears of their headphones: left ear = PFL (or CUE); right ear = the current monitor source (e.g. PGM 1).

You can use this mode to monitor the main program output while cueing up another source (pre-fader).

8.10.6 Talkback

Fader Strips (Talk to Source)



You can talk to any of the following sources by pressing the **Talk** key on the corresponding fader strip:

- Guest mics: MIC 2, MIC 3 and MIC 4
- Hybrids: HYB 1 and HYB 2
- AES CODEC
- RAVENNA CODECS (1 to 4)

The **TALK** keys are momentary, so hold the key down for as long as you wish to speak.

The talkback source is always the DJ's microphone (**MIC 1**). When talkback is added to the return, the main signal is dimmed by -20dB.

8.10.7 PFL / CUE

The pre-fade listen function varies slightly depending on the console edition.

Fader Start Edition

On Fader Start consoles, the function is called **PFL** and can be found on the large key at the bottom of the fader strip. Multiple **PFLs** can be active to listen to a number of sources:

- On a closed fader, press **PFL** to route the source onto the stereo PFL bus; the **PFL** automatically cancels when you open the fader.
- On an open fader, press **PFL** to put the channel into "PFL Prepare". Nothing happens until you close the fader; once the fader is closed, **PFL** becomes active.

Button Start Edition

On Button Start consoles, the pre-fade listen function is called **CUE** and can be found on one of the small buttons by the electronic display. Multiple **CUEs** can be active to listen to a number of sources.

- On any fader (open or closed), press **CUE** to route the source onto the stereo cue bus. To remove the source from the cue bus, deselect the **CUE** button.

Note that on a Button Start console, there is no automatic cancellation of PFL and no "PFL Prepare".

Monitoring Options

Whenever PFL (or CUE) is active, the bus is switched to the control room speakers and DJ headphones. The monitor outputs will return to their active monitor source once all PFL (or CUE) selections are cleared.

Select **CLEAR PFL** on the Central Module to cancel all active PFLs quickly.

8.11 Master Functions

This section describes the master functions which appear on DisplayDock and/or control surface: global alarm indicator, system clock, timer, telephone call signaling for hybrid sources and mic open indicator.

8.11.1 Global Alarm

On DisplayDock, a global **ALARM** indicator appears if any of the individual alarm states is active.

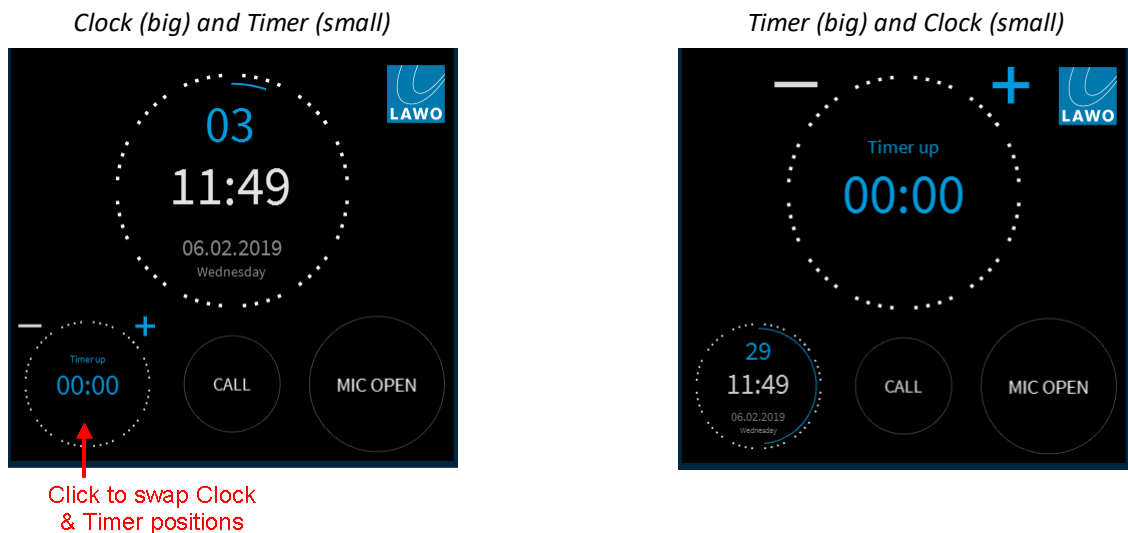
Select the **ALARM** indicator to open the [Advanced](#) page - under "TEMPERATURE & FAN ALARMS" you will be able to see which alarms are active.

The global **ALARM** indicator disappears once all active alarm states are either resolved or acknowledged on the "Advanced" page.

8.11.2 System Clock & Timer

DisplayDock includes both a system clock and count-up/count-down timer.

By default, the clock appears (big) with the timer (small). However, the functions can be reversed by clicking on the smaller of the two elements:



8.11.3 System Clock

The system clock shows the internal date and time running on the Compact Engine. This can be set using SoP Explorer (as described [earlier](#)).

The time is given using a 24 hour digital clock where hours and minutes appear in white and seconds in blue. In our first example on the left, the current time is 11 hours, 49 minutes and 03 seconds. For greater visibility, the "seconds" are also represented by the blue line/circle around the circumference of the display.

8.11.4 Timer Operation

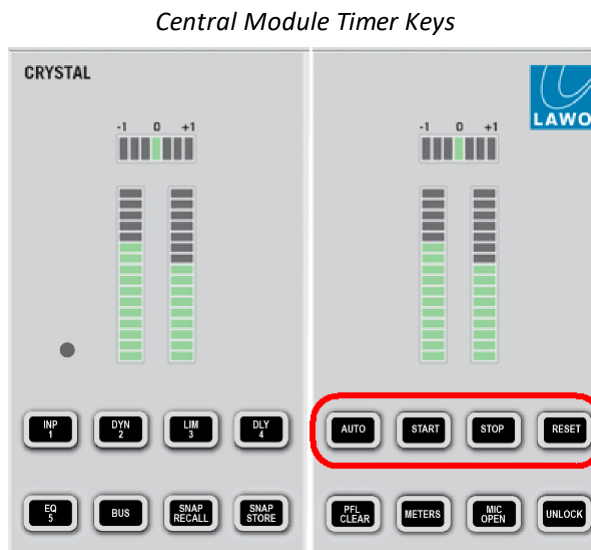
The DisplayDock timer can be set to Count-Up or Count-Down, and be triggered either automatically or manually.

The Count-Up or Count-Down mode is selected from the GUI by clicking on the + and - signs (which are visible when the timer is [big](#)):



- Click on the + sign (it turns blue) to use the timer in count-up mode.
- Click on the - sign (it turns red) to change the timer to count-down mode.

The triggering method is selected from the Central Module using the **AUTO** key: **AUTO** (on) = automatic timer mode; **AUTO** (off) = manual timer mode.



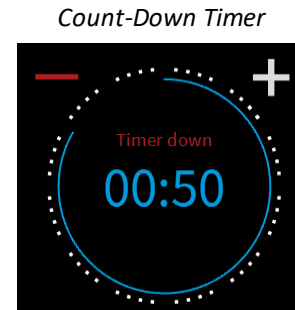
For the operation, there are actually three possibilities (indicated by the timer label):

- "Mics up" or "Mics Down" = the timer is set to AUTO mode and to count only when a MIC fader is open (applies to all four MIC sources).
- "Faders up" or "Faders down" = the timer is set to AUTO mode and to count when any fader is open.
- "Timer up" or "Timer down" = the timer is set to manual mode.

Manual Timer Operation

To use the timer manually:

1. First make sure that the **AUTO** key (on the Central Module) is turned off.
2. Then set your count-up or count-down mode using the + and - signs (on the GUI):



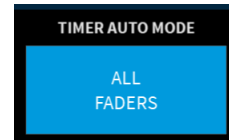
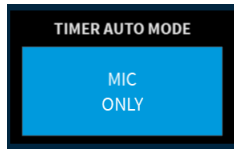
In count-up mode, the timer will count up from 00:00. In count-down mode, the timer will count down from a **Preset** value (described [later](#)).

3. Use the **START**, **STOP** and **RESET** keys (on the Central Module) to operate the timer:
 - **START** - starts the timer from the last stop position/time.
 - **STOP** - stops the timer.
 - **RESET** - resets the timer, either to 00:00 (count-up) or the **Preset** value (Count-down).

Automatic Timer Operation

To trigger the timer automatically:

1. First make sure that the **AUTO** key (on the Central Module) is turned on.
2. Then open the [Advanced](#) page to set the "TIMER AUTO MODE". There are two possible states:

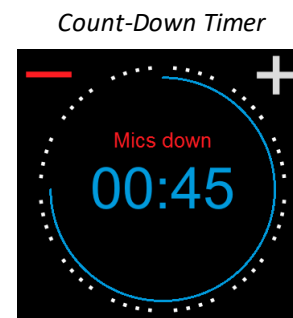
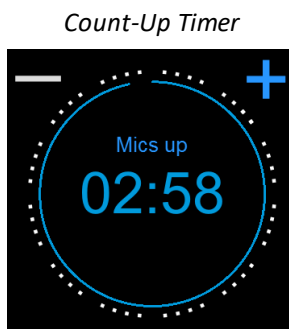


- **MIC ONLY** = the timer will count only when a MIC fader is open (on MIC 1 to 4).
- **ALL FADERS** = the timer will count when any fader is open.

Note that this option *only* becomes active once you have enabled the **AUTO** key in step 1. Otherwise the timer operates in manual mode. The color of the "TIMER AUTO MODE" option indicates this: red = auto mode on; blue = auto mode off.

3. Set your count-up or count-down mode using the + and - signs (on the GUI).

In our example, **MIC ONLY** is selected (in step 2) and so you will see either "Mics up" or "Mics down" as the timer label:



4. Start and stop the timer by opening and closing the faders on the surface.

For our example, open one of the MIC source faders. If another MIC fader opens, then the timer continues to run. The timer will stop once all MIC source faders are closed.

Depending on the mode, the timer will count-up from 00:00 or count-down from a **Preset** value (described [later](#)).

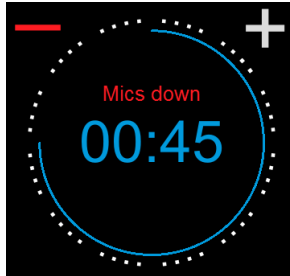
Note that the current time remains on-screen until the timer is reset.

5. To reset the timer, press the **RESET** key (on the Central Module).

Count-Down Timer Operation

In this mode, the timer will count-down from a starting value (called the **Preset** time), and turn red once a mid-point (the **Alarm** time) is reached:

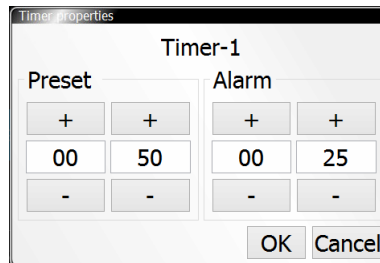
Count-Down (before Alarm)



Count-Down (Alarm active)



1. To set the **Preset** and **Alarm** time values, select the current count-down time - the Timer properties window opens:



The **Preset** value defines the starting time. When you reset the timer, it will return to this setting - in our example, to 50 seconds.

The **Alarm** value is used for the signalisation. When the count-down reaches this time, it turns red - for example, at 25 seconds.

In both cases, use the minute and second fields to type in a value, or select the **+** and **-** buttons to increase and decrease the current values. Then select **OK** to confirm.

2. For our example, open one of the MIC source faders to start the count-down from the **Preset** time.

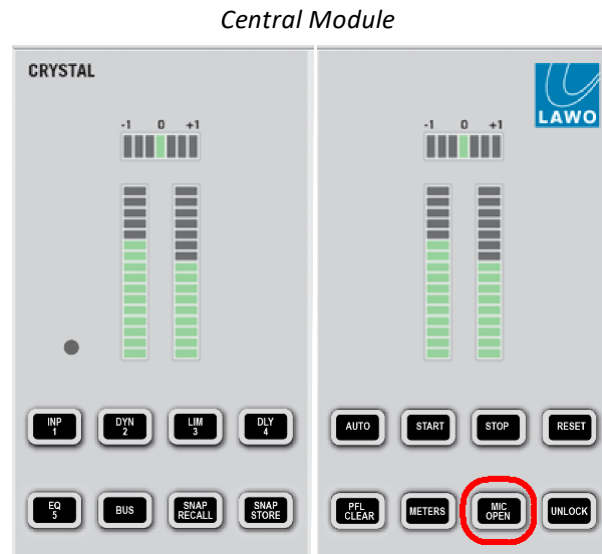
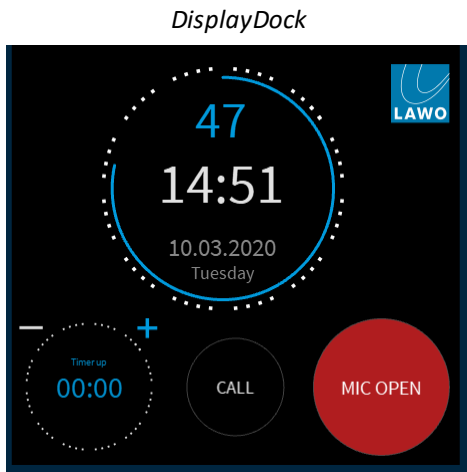
When the count-down reaches the **Alarm** time, the numbers turn red to warn you that you are almost out of time. If the count-down reaches 00:00, then the timer starts to count back up. This shows you by how much you are overrunning! In this instance, the Alarm status remains active until the timer is reset.

3. For our example, the timer stops once all MIC source faders are closed.

Note that the current time remains on-screen until the timer is reset.

4. To reset the timer, press the **RESET** key (on the Central Module).

8.11.5 MIC OPEN Indicator

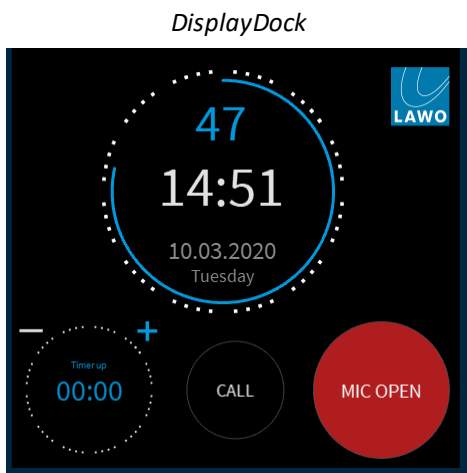


The **MIC OPEN** indicator lights in red whenever at least one MIC source fader is open. If no MIC faders are open, then the indicator goes out.

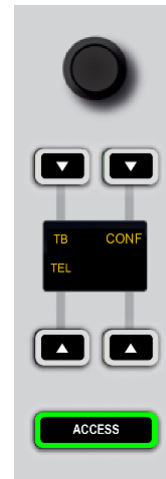
The state is triggered by the four MIC sources, and is applied independently from the channel status (ON/OFF).

The **MIC OPEN** status can also trigger two external red lights, one in the control room and one in the studio, by preparing the [REDLIGHT](#) options in DisplayDock.

8.11.6 CALL Signaling



Fader Strip (HYBRID source)



The **CALL** indicator (on DisplayDock) blinks in yellow if there is an incoming call to a hybrid source. Press the **TEL** key on the source's fader strip to answer the call.

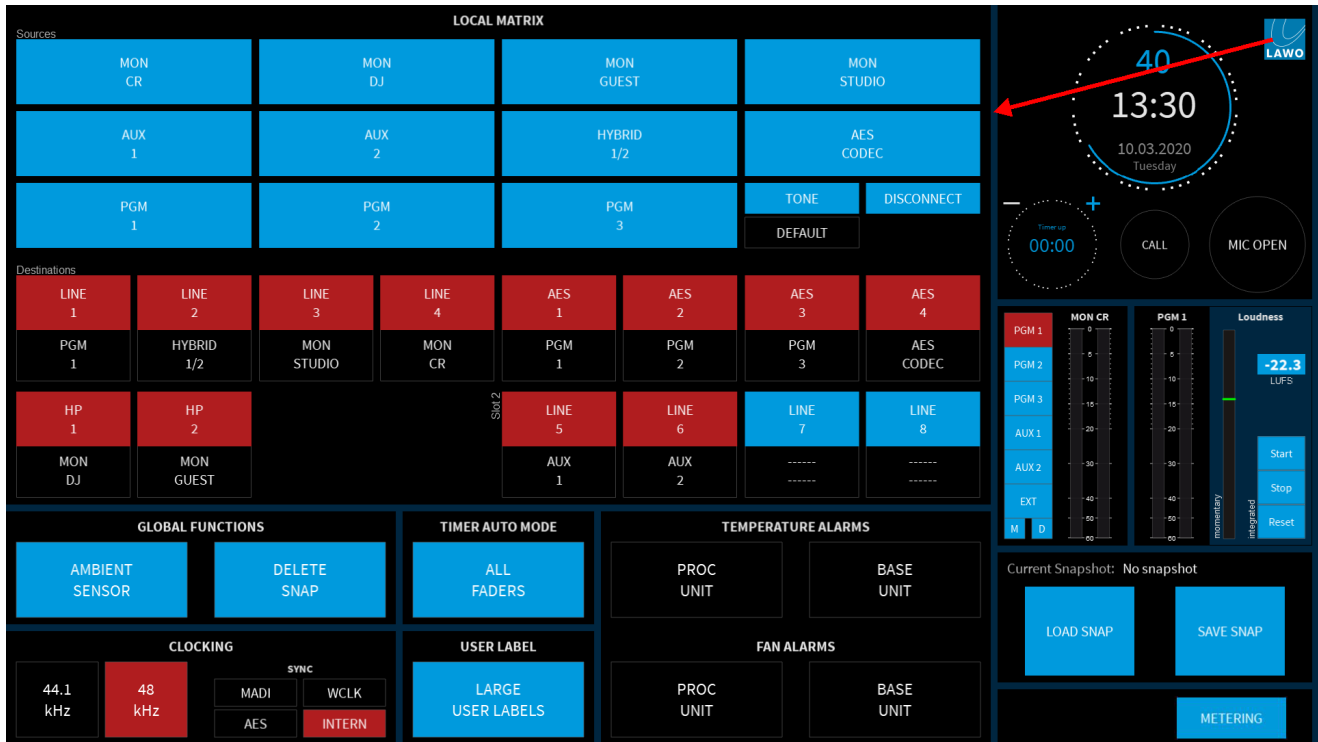
To support this function, the GPIO connector must be correctly wired as GPIOs 7 and 8 are used to trigger the incoming calls. See [GPIO functions](#) and [Connector Pin-Outs](#).

8.12 The Advanced Page

The Advanced page (on DisplayDock) provides access to the local matrix and global options.

To open the page, click on the Lawo logo at the top right of the DOCK - the Advanced page appears in full-screen view:

ADVANCED + DOCK



The local matrix is described in the [next](#) topic. The other options and indicators are as follows.

AMBIENT SENSOR

Use this option to turn the ambient light detector on the [Central Module](#) on or off: red = on; blue = off. When enabled, the detector automatically adjusts the brightness of the buttons and displays on the control surface according to the ambient light level.

DELETE SNAP

Use this button to delete a DisplayDock snapshot. Snapshots are described in more detail [later](#).

CLOCKING

The "CLOCKING" area shows the active sync source and sample rate.

The "SYNC" fields are indicators only; you cannot change the sync source from the GUI: red = active; blue = available. In our example, the active sync source is **INTERNAL**.

The **48kHz** and **44.1kHz** buttons indicate the sample rate of the internal clock generator: red = active. The sample rate can be changed when all faders are closed (off-air) and UNLOCK (on the Central Module) is pressed. In this instance, the button colors update to red = active and blue = inactive but available. Select the inactive (blue) option to make the change. Once a fader is opened, the blue state cancels showing that it is no longer possible to change the sample rate. After a cold start, the internal generator will reset to the default value stored in the configuration (48kHz).

See [Synchronization](#) for more details.

TIMER AUTO MODE

This option sets the automatic mode for the count-up/count-down timer. There are two possible states:

- **MIC ONLY** = the timer will count only when a MIC fader is open.
- **ALL FADERS** = the timer will count when any fader is open.

Note that the option *only* becomes active if the timer mode is set to **AUTO** (automatic) on the [Central Module](#). Otherwise the timer operates in manual mode. The color of the option indicates this: red = auto mode on; blue = auto mode off.

For more information, see [Timer Operation](#).

USER LABEL

This option sets the size of the user labels displayed at the bottom of the [fader strips](#). The button will toggle between the two possible states: blue = regular size labels; red = large user labels.

TEMPERATURE & FAN ALARMS

These buttons show the current status of the individual alarms. If an alarm is triggered, then the corresponding button starts to blink in red. You can press to acknowledge the alarm - the button changes to static red. Once the alarm is resolved, the button color turns black (off).

8.12.1 The Local Matrix

The local matrix allows you to change the default audio assignments for the line-level, headphone and AES3 outputs.

Advanced Page (Local Matrix)

| LOCAL MATRIX | | | | | | | | | |
|--------------|--|------------|--|------------|--|-----------|--|------------|--|
| Sources | | MON CR | | MON DJ | | MON GUEST | | MON STUDIO | |
| AUX 1 | | AUX 2 | | HYBRID 1/2 | | AES CODEC | | | |
| PGM 1 | | PGM 2 | | PGM 3 | | TONE | | DISCONNECT | |
| | | | | | | DEFAULT | | | |
| Destinations | | LINE 1 | | LINE 2 | | LINE 3 | | LINE 4 | |
| AES 1 | | AES 2 | | AES 3 | | AES 4 | | | |
| PGM 1 | | HYBRID 1/2 | | MON STUDIO | | MON CR | | AES CODEC | |
| HP 1 | | HP 2 | | | | LINE 5 | | LINE 6 | |
| MON DJ | | MON GUEST | | Slot 2 | | AUX 1 | | AUX 2 | |
| | | | | | | LINE 7 | | LINE 8 | |
| | | | | | | ----- | | ----- | |

The matrix is divided into two halves: "Sources" at the top and "Destinations" at the bottom.

The available "Sources" are:

- The monitor outputs: MON CR, MON DJ, MON GUEST & MON STUDIO.
- The summing bus outputs: PGM 1 to 3 and AUX 1 & 2.
- The N-1 outputs for HYBRID 1 & 2 (as a dual-mono feed) and the AES CODEC.
- Internal TONE.

Each of the "Destination" buttons represents a local stereo output (e.g. LINE 1, LINE 2, etc). The label below the button shows the assigned source (e.g. PGM 1, HYBRID 1/2, etc). If a destination is already assigned, then its button is red. If no audio is assigned, then the button is blue. Note that the assignments shown above are the default audio assignments for a Button Start console. The default audio for a Fader Start console is identical other than Slot 2 is fitted with an AES3 IO card rather than LINE IO.

To change an output assignment:

1. Select a "Destination" button - the button starts to flash.
2. Select an available "Source" (e.g. PGM 1) - the routing assignment is made and the button changes to static (red).
3. Alternatively, repeat step 1 and then select **DISCONNECT** - the current audio source is removed and the button changes to static (blue).

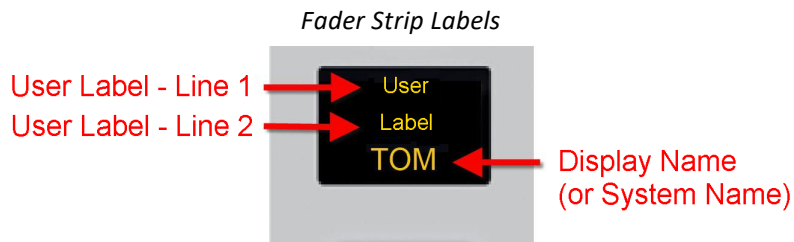
DEFAULT Audio

The **DEFAULT** button can be used to reset the matrix to the default audio assignments (shown on the previous page).

Note that you will need to press and hold **UNLOCK** (on the [Central Module](#)) before you can select **DEFAULT** (on the GUI). This prevents an accidental reset of the output matrix.

8.13 Editing User Labels

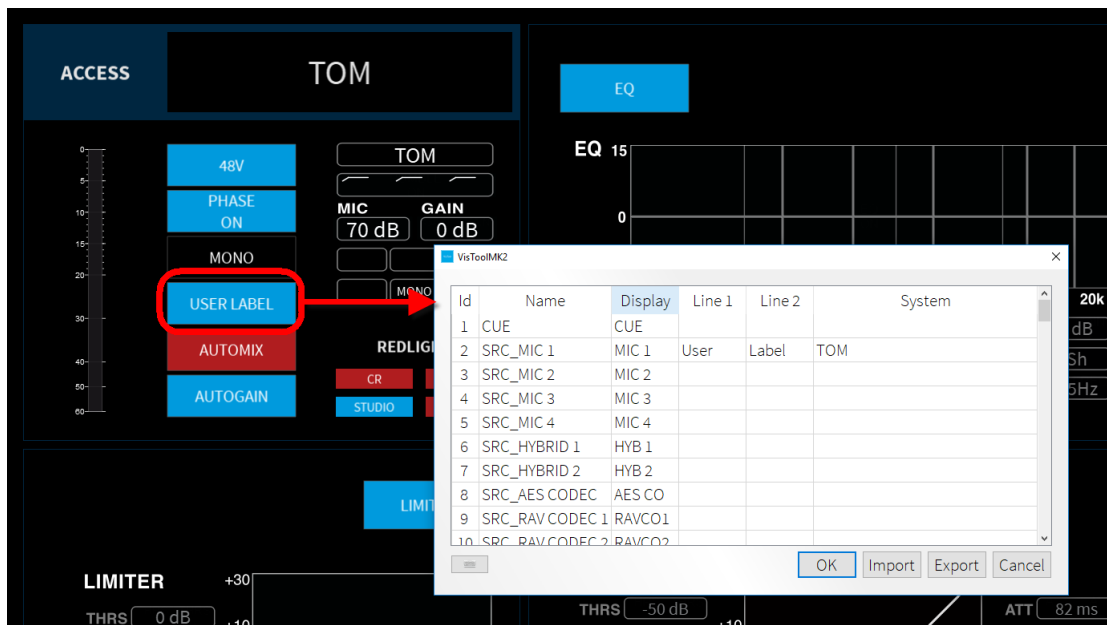
The displays at the bottom of each fader strip can show up to three lines of text:



To edit the text:

1. Start by pressing an **ACCESS** key (on any fader strip) - the key turns white and the "Source Parameters" page appears on DisplayDock.
2. Select the **USER LABEL** button (on DisplayDock) to open the editor:

DisplayDock (User Label Editor)



From here you can edit the labels for all sources. The **Id**, **Name** and **Display** fields are defined by the ON-AIR Designer configuration and cannot be changed. By default, a source uses its **Display** name unless a **System** name is entered.

3. Use the **Line 1** and **Line 2** fields to edit the two user label lines (up to 8 characters per line).
4. To replace the **Display** name, enter text into the **System** field. The **System** name replaces the **Display** name until such time as the **System** field is cleared.
5. Once you have finished editing, select **OK** to transfer the labels to the system - the editor closes and the labels on the control surface update.

The **Export** button will save all labels into an **.xml** file. This allows to copy the file to another DisplayDock PC and then select **Import** to import the labels. When using import, the labels are applied to sources with an identical source **Name** field.

8.14 Conference Bussing (N-1/Mix Minus)

The conference system can be used to generate N-1/mix minus feeds for the following sources: all MICs, HYBRIDs and CODECs.

Each source added to the conference system receives an automatically switched mix minus feed. When their source fader is open (on-air), they will hear PGM 1 minus themselves. When their source fader is closed (off-air), they will hear the conference bus minus themselves - this allows members of the conference to hear each other while they are off-air.

Let's assume you wish to use the conference system for 3 sources: **MIC 1** (the DJ), **MIC 2** (a studio guest) and **HYB 1** (a phone-in guest).

Setting Up the Monitoring

The first step is to set up the monitoring so that the mix minus feed for each source is returned to the correct destination. For our example, we will assume:

- The DJ is listening on his/her headphones (controlled via HP DJ).
- The studio guest is also listening on his/her headphones (controlled via HP GUEST).
- The phone-in guest is receiving the HYB 1 mix minus return (there are no separate level controls for this output).

You can check and edit the audio assignments from the [local matrix](#). If the system is set to the DEFAULT audio, then:

- Connect the DJ headphones to HEADPHONE 1 (Compact Engine rear panel).
- Connect the guest headphones to HEADPHONE 2 (Compact Engine rear panel).
- Connect the phone-in guest's return to the HYB 1 n-1 return (i.e. Compact Engine rear panel, LINE OUT connector, output 3).

Working with the Conference System

Once the monitoring returns are in place, then the conference system operates as follows:

1. Turn on the **CONF** bus assign buttons for all sources within the conference – in our example, on the **MIC 1**, **MIC 2** and **HYB 1** fader strips.

This routes each source onto the conference bus; the **CONF** buttons will turn red, yellow (flashing) or white depending on the status of the faders:



For the conference system to work you must have at least two sources with **CONF** enabled.

Each source within the conference system now receives an automatically switched mix minus feed; what they hear will depend on the status of the three source faders.

2. Close all three source faders.

The **CONF** buttons become red and all sources will hear the conference bus minus themselves. In other words, they can hear each other, but not themselves, and chat off-air.

3. Open one of the faders – e.g. the DJ's fader.

The MIC 1 source is now assumed to be on-air, and the DJ's monitor feed is automatically switched to PGM 1 minus themselves. This is reflected by the flashing (yellow) **CONF** button:



The **CONF** buttons on the studio and phone-in guest fader strips remain red. This is because their faders remain closed, and so the two guests are still hearing the conference bus minus themselves and can continue their off-air conversation. Also, if you close the DJ fader, the DJ's monitor feed reverts to a conference bus mix minus, so they can rejoin the off-air conversation if required.

4. Finally, open both the MIC 1 and MIC 2 faders.

Both the DJ and studio Guest are now on-air, and so they will hear PGM minus themselves (yellow flashing **CONF** buttons):



In this mode, there are less than two active conference sources and so the conference is cancelled. The phone-in guest's monitor feed is automatically switched to a PGM 1 mix minus. This state is reflected by the white **CONF** button.

5. To cancel the conference for any of the sources, deselect the **CONF** button.

The **CONF** buttons turn green (off) and the source's monitor feed receives PGM 1 minus themselves at all times.

8.15 Snapshots

The snapshots system includes five local memories (stored on the Compact Engine) plus an unlimited number of DisplayDock snapshots (stored on the control PC).

The local memories always save and load settings globally, while DisplayDock snapshots come in two types: Full snapshots (to save settings globally) or Source snapshots (to save only the settings for the source in access).

It is not recommended that snapshots are loaded during a live broadcast, as to do so may result in sources being taken off air!

8.15.1 What's Stored in a Snapshot?

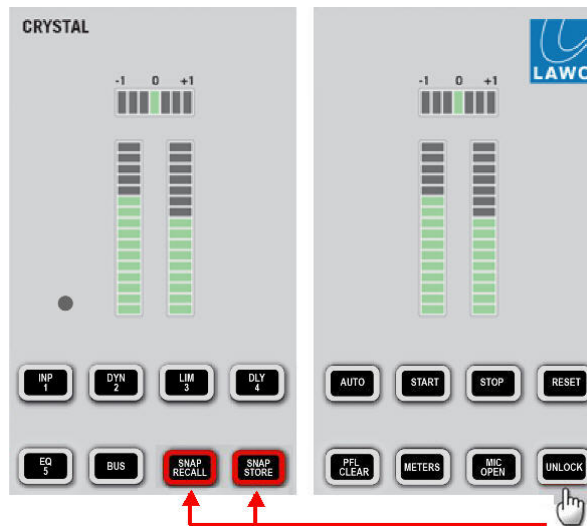
The following settings are stored (and recalled) by all snapshots:

- **Fader Strip Assignment** – the assignment of sources to fader strips.
- **User Labels** – the two User Label text lines for all sources.
- **DSP settings** – Input Parameters, EQ, Dynamics, Limiter, and De-Esser for all sources.
- **Bus Assignment** – the assignment of sources onto the console's summing buses and their AUX send levels.
- **Local Matrix Assignments** – the assignment of the destinations in the local matrix.

Note that fader levels are not stored (and recalled) so that snapshots can be used during a live transmission without affecting the current channel levels.

8.15.2 Using the Local Snapshot Memories

The five local snapshot memories always reset the console globally, and are stored, recalled and cleared using the keys on the Central Module. For each operation you will need to press **UNLOCK** to unlock **SNAP RECALL** and **SNAP STORE**.

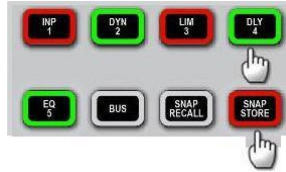


➤ **To store settings in a local memory:**

1. Press and hold **UNLOCK** followed by **SNAP STORE**.

If a memory has been used, then the numbered buttons, **1** to **5**, illuminate in red. A green button indicates a free memory. If you select a used memory, then its contents will be overwritten.

2. Keep holding **SNAP STORE** and select a memory - e.g. number **4**.



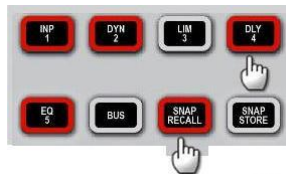
The **SNAP STORE** button flashes magenta to indicate a successful operation.

➤ **To recall settings from a local memory:**

1. Press and hold **UNLOCK** followed by **SNAP RECALL**.

You can see which memories contain data by looking at the lit buttons - in our example, there is data stored in memories **1**, **2**, **4** and **5**.

2. Keep holding **SNAP RECALL** and select a memory - e.g. number **4**.

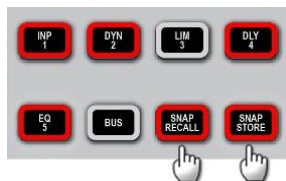


The **SNAP RECALL** button flashes magenta to indicate a successful operation and the console resets.

➤ **To clear a local snapshot memory:**

1. Press and hold **UNLOCK** followed by both **SNAP RECALL** and **SNAP STORE**.

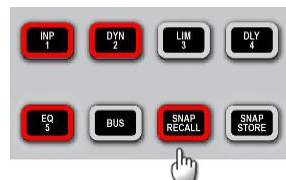
You can see which memories contain data by looking at the lit buttons - in our example, there is data stored in memories **1**, **2**, **4** and **5**.



2. Keep holding **SNAP RECALL** and **SNAP STORE** and select a memory - e.g. number **4**.

The snapshot memory is cleared.

3. To check if the operation has been successful, press and hold **SNAP RECALL** - the memory number should now be clear (unlit).

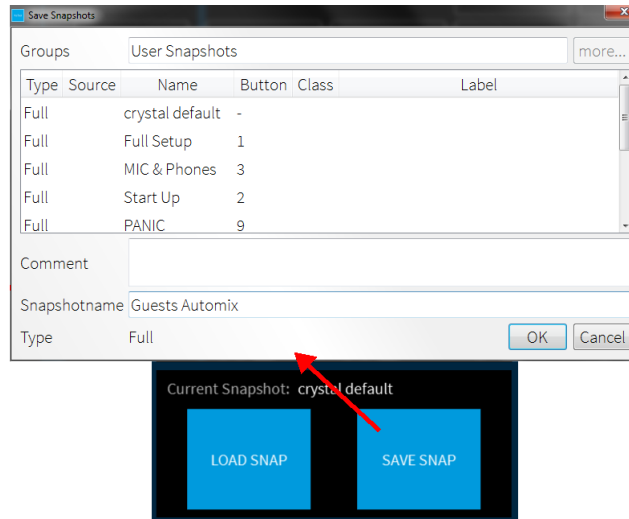


8.15.3 Saving a DisplayDock Snapshot

When you save a DisplayDock snapshot, you can choose to save either a **Full** snapshot (to save settings globally across the console) or **Source** snapshot (to save only the settings for the source in access). The **SAVE SNAP** button (on the DOCK) supports both operations as follows.

➤ **To save a Full snapshot:**

1. Check that there is no source in access and select **SAVE SNAP** - the "Save Snapshot" window appears:



2. Enter a snapshot name (e.g. **Guests Automix**) and select **OK** - the window closes and the settings are saved.

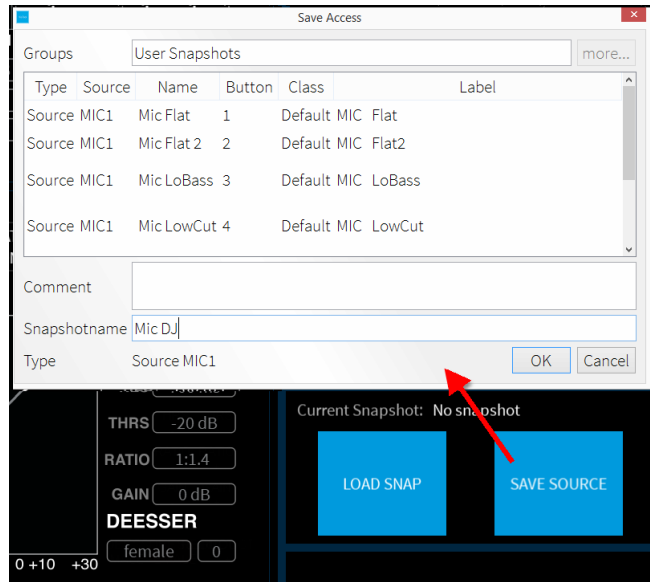
Note that the snapshot **Group** and **Type** cannot be changed. You can enter text to describe the snapshot into the **Comment** field if you wish.

➤ **To save a Source snapshot:**

1. Press an **ACCESS** key (on the control surface) to select the source you wish to save.

The **ACCESS** key turns white and the [Source Parameters](#) page appears on DisplayDock. Notice that the **SAVE SNAP** button has updated to **SAVE SOURCE**.

2. Select **SAVE SOURCE** - the "Save Access" window appears:



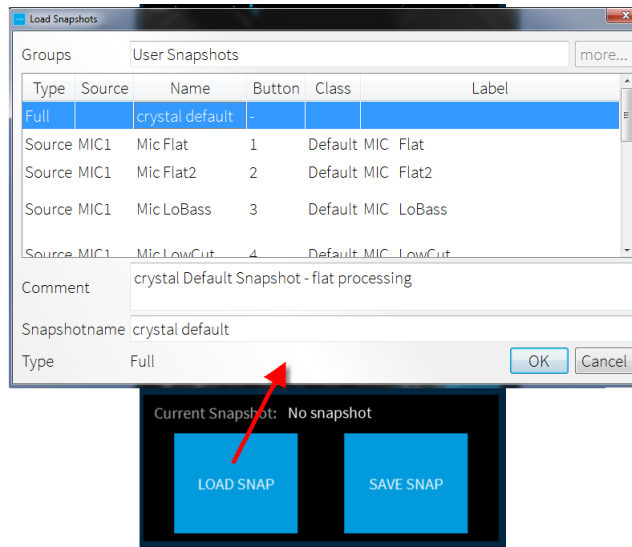
2. Enter a snapshot name (e.g. **Mic DJ**) and select **OK** - the window closes and the settings are saved.

Note that the snapshot **Group** and **Type** cannot be changed. You can enter text to describe the snapshot into the **Comment** field if you wish.

8.15.4 Loading a DisplayDock Snapshot

➤ To load either a **Full** or **Source** snapshot:

1. Select **LOAD SNAP** - the "Load Snapshot" window appears:



This window lists all of the snapshots stored in the current user group. In a crystal standard configuration system, one group is available: **User Snapshots**.

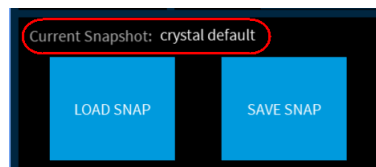
In the **Type** column you can see that two types of snapshot are available:

- **Full** snapshots store and recall settings globally across the console.
- **Source** snapshots store settings for a specific source.

Note that **Source** snapshots can be loaded either to the source in access OR to their original source (if nothing is in access). The original source is identified in the **Source** column.

2. Select a snapshot from the list and select **OK** - the window closes and the settings are loaded to the system.

The console surface resets accordingly and "Current Snapshot" field on DisplayDock updates:



8.15.5 Deleting a DisplayDock Snapshot

You can delete a DisplayDock snapshot from the [Advanced](#) page using the "GLOBAL FUNCTIONS":



1. Select **DELETE SNAP** - the "Delete Snapshot" window appears.

This window lists all of the snapshots stored in the current user group. In a crystal standard configuration system, one group is available: **User Snapshots**.

2. Select a snapshot from the list and select **OK** - the window closes and the snapshot is deleted.

8.15.6 Backing Up DisplayDock Snapshots

DisplayDocksnapshots are stored on the control PC in a file named "VisConfigurations.mdb". After a standard installation of the DisplayDock software, the file can be found at:

C:\ProgramData\DSA\DisplayDock (Crystal)\database\VisConfigurations.mdb

If you wish to backup your DisplayDock snapshots, then make a copy of the file and store it in a secure location.

9. The Web UI

This chapter describes the Web UI.

Topics include:

- [Introduction](#)
- [Opening a Session](#)
- [The System Page](#)
- [TCP Connections](#)

9.1 Introduction

The Web UI provides status information about the system. It is accessed by entering the IP Address of the Compact Engine you wish to examine into a Web browser. The computer you use must be part of the same network and subnet as the Compact Engine.

9.2 Opening a Session

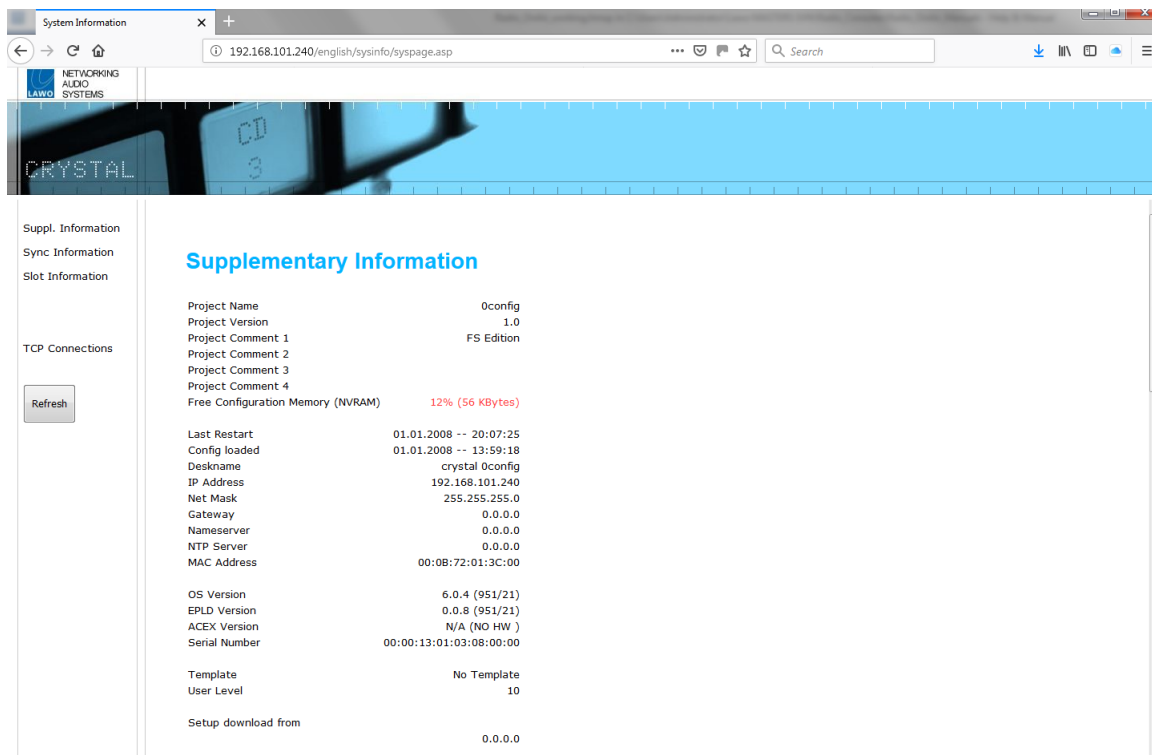
To open a Web UI session:

1. Open a browser application and enter the system IP address into the URL field (e.g. 192.168.101.240).

To ensure all graphics are correctly displayed, we recommend the following minimum browser requirements: Internet Explorer 10 or Edge 12; current Versions of Firefox, Safari or Chrome.

You can view the Compact Engine IP address on the front panel display. The default IP Address = 192.168.101.240

Following a successful connection, the [System Page](#) appears.



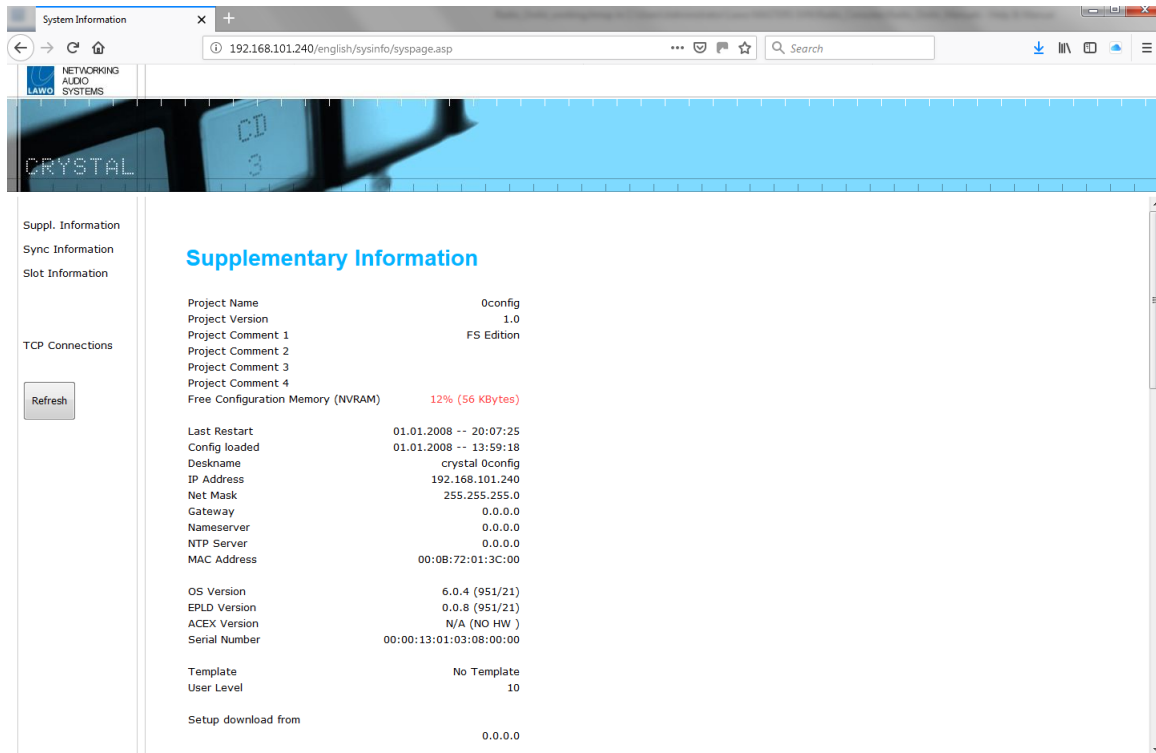
The Web UI has two pages: system and TCP connections. Use the navigation buttons on the left to change page, and then scroll up and down to access the information.

Compact Engine has many system parameters, and it will take a few seconds for the information to load completely. Some of the information is displayed as a "snapshot" of the current data, which is only as current as the latest refresh. So, remember to use your browser's Refresh function, or click on **Refresh**, to keep up to date.

9.3 The System Page

This is the main page containing the majority of information.

9.3.1 Supplementary Information



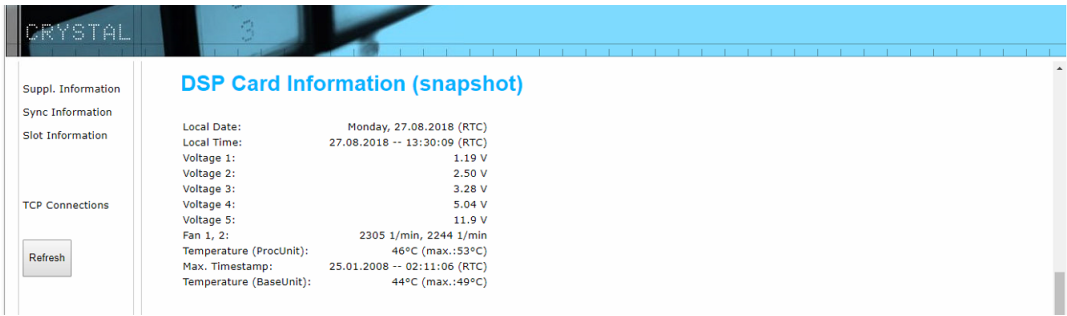
The **Supplementary Information** displays basic data such as the unit's IP settings, serial number and software / firmware version numbers.

If the unit has not yet been configured, then the project name and description will be a default description. After configuration, these fields display the information entered using the ON-AIR Designer software.

The fields show:

- **Project Name, Version, Comments** - as entered in the system configuration.
- **Free Configuration Memory** - the amount of free memory (for the configuration). Note that this appears in green when there is plenty of memory left, and in red if the available memory falls below 20%.
- **Last Restart** - the date and time of the last system restart.
- **Config loaded** - the date and time when the last configuration was loaded.
- **Deskname, IP Address, Net Mask, Gateway, Nameserver, NTP Server, MAC Address** - the TCP/IP settings of the Compact Engine control system.
- **OS Version** - this is the version of Operating Software running the control system. (Otherwise known as the 'ticker' version.)
- **EPLD Version** - this is the version of DSP firmware running on the DSP chips.
- **ACEX Version** - this is the version of MADI chip firmware running on the MADI chips (if fitted).
- **Serial Number** - this is the serial number of the Real Time Clock (RTC) chip.
- **Template** - the configuration template used.
- **User Level** - the user mode which created the configuration (in the On Air Designer configuration software).
- **Setup download from** - the IP address of the computer used to load the On Air Designer configuration.

9.3.2 DSP Card Information



The **DSP Card Information** shows the system date and time, and feedback on the physical state of the Compact Engine hardware.

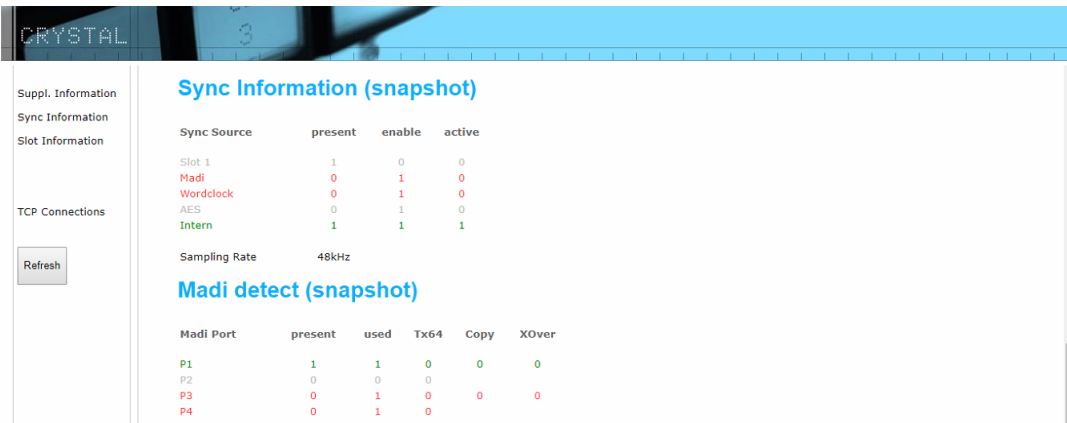
The system date and time is provided by your network’s NTP server. If an NTP server is not present, then the internal Real Time Clock (RTC) is used. This can be reset using SoP Explorer. The time zone can also be edited by opening a Telnet session to the Compact Engine. See [Setting the System Date and Time](#), and [Setting the Time Zone](#).

The fields show:

- **Local Date and Local Time** – the current system date and time.
- **Voltage** – the current voltages within the system.
- **Fan 1 and 2** – the fan speeds within the Compact Engine.
- **Temperature (Proc Unit & Compact Engine)** – the current internal temperatures of the Compact Engine. In brackets (), you will see the maximum temperature which has been reached. The **Max. Timestamp** displays when the maximum temperature was reached.

The temperature snapshots should only be used as a guide. Please refer to the Compact Engine [data sheet](#) for details on tolerances.

9.3.3 Sync Information



The **Sync Information** shows the status of the sync sources:

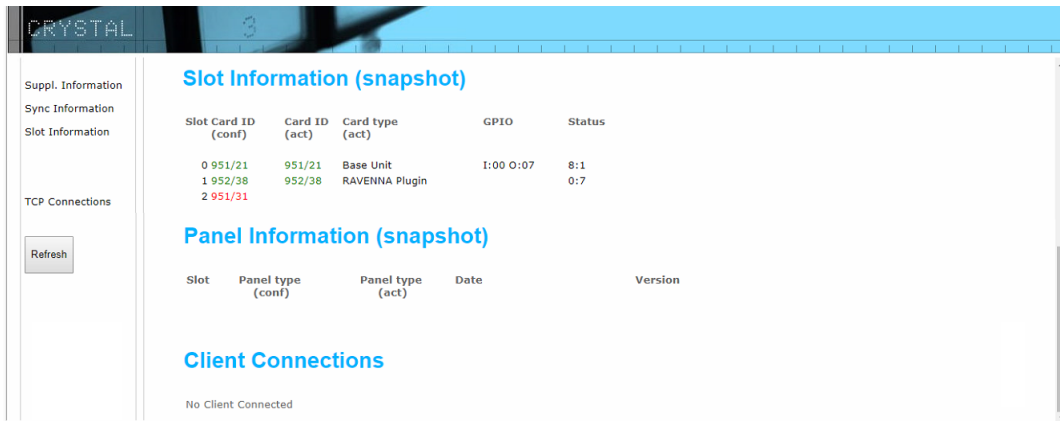
- **Sync Source** – the sync signal status:
 - If **present = 1**, there is a valid sync signal.
 - If **enable = 1**, then the sync source is enabled in the configuration.
 - If **active = 1**, then this is the active sync source for the system.
- **Sampling Rate** – the operating frequency for the system (e.g. **48kHz**).

9.3.4 MADI Detect

The **MADI detect** table shows the status of each MADI port fitted to the Compact Engine:

- If **present** = 1, there is a valid input signal.
- If **used** = 1, then the port is enabled in the configuration.
- If **Tx64** = 1, then the port is configured to transmit 64 slots.
- If **Copy** = 1, then the port is configured for output redundancy.
- If **XOver** = 1, then the port is switched to the redundant port.

9.3.5 Slot Information



| Slot Card ID (conf) | Card ID (act) | Card type (act) | GPIO | Status |
|---------------------|---------------|-----------------|-----------|--------|
| 0 951/21 | 951/21 | Base Unit | I:00 O:07 | 8:1 |
| 1 952/38 | 952/38 | RAVENNA Plugin | | 0:7 |
| 2 951/31 | | | | |

| Slot | Panel type (conf) | Panel type (act) | Date | Version |
|---------------------|-------------------|------------------|------|---------|
| No Client Connected | | | | |

The **Slot Information** shows the status of the plug-in cards fitted to the Compact Engine. If a card is red, then there is a problem - for example, it may be configured but not fitted.

- **Slot** – the slot number within the frame
- **Card ID (conf)** – the card ID assigned within the configuration.
- **Card ID (act)** – the card ID actually fitted and running within the slot.
- **Card type (act)** – short description of the card type.
- **GPIO** – the status of the contacts on a GPIO card.
- **Status** – the values of the status bits for each card.

Please refer to the relevant data sheet for more details.

9.3.6 Panel Information

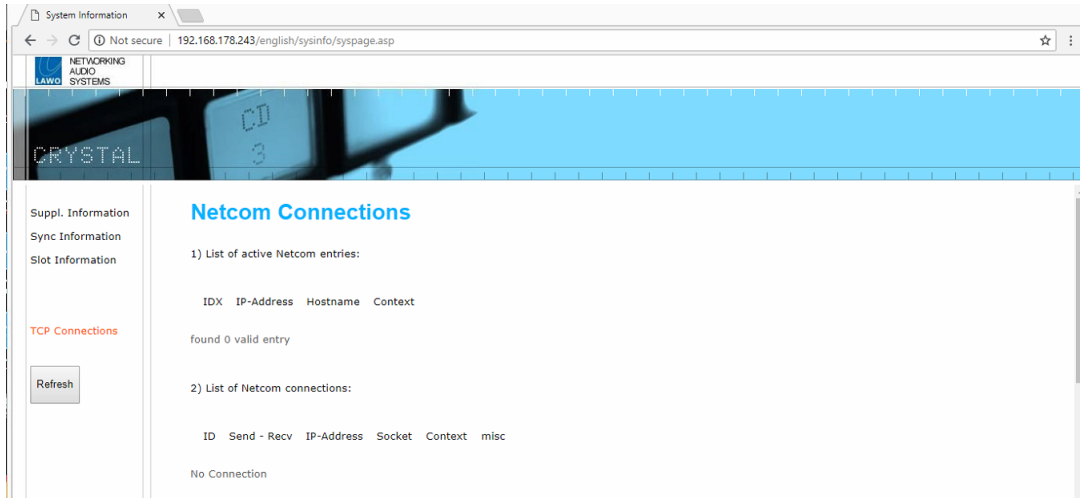
The **Panel Information** shows the status of the control surface modules/panels. If a module is red, then there is a problem - for example, it may be configured but not fitted.

- **Slot** – the CAN bus address for the module or panel.
- **Panel type (conf)** – the module or panel type assigned within the configuration.
- **Panel type (act)** – the module or panel type which is actually connected and switched on. This should be identical to that assigned within the configuration for correct operation.
- **Date** – the date and time at which the software running on the module or panel was created.
- **Version** – the version of software running on the module or panel.

9.3.7 Client Connections

The **Client Connections** show all network clients connected to the system. For example, the IP Addresses of any networked sapphire, crystal, Nova29, etc.

9.4 TCP Connections



This page displays the network connections to the Compact Engine, and the state of those connections:

- **Netcom Connections** - systems connected via GNET (GPIO Network).
- **DMS Connections** - systems connected via DMS, for example VisTool PCs.
- **EmBER+ Connections** - EmBER+ consumers and providers.

10. Maintenance

This chapter describes the maintenance procedures available for the system.

Topics include:

- [Restarting the System](#)
- [Compact Engine Procedures](#)
- [Control Surface Procedures](#)
- [Cleaning the Devices](#)

10.1 Restarting the System

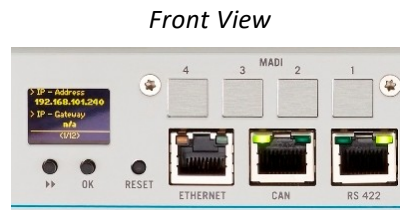
When the Compact Engine boots-up it can perform either a warm or cold start.

10.1.1 Warm Start

Every time the system shuts down it stores the current state of all settings so that they can be loaded on boot-up (known as a warm start).

A warm start is used whenever you power cycle the device to ensure that the device returns to its last known state if power is cut and then re-applied.

You can also force a warm start by pressing the **RESET** button on the front panel. The button is recessed to prevent accidental operation.



A warm start will reboot the device. Do **NOT** perform a warm start while live on air!

10.1.2 Cold Start

Alternatively, the system can boot using a cold start. A cold start ignores the warm start data, and resets all internal logic states and audio parameters to the default values stored in the configuration.

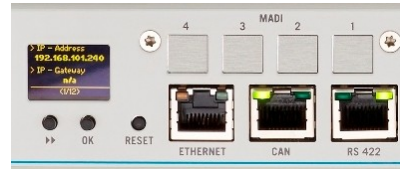
For most systems a cold start can be triggered by transferring a new configuration onto the device or updating its firmware. The exception is the **Nova29** which must be cold started by opening a telnet session.

A cold start will reboot the device. Do **NOT** perform a cold start while live on air!

10.2 Compact Engine Procedures

10.2.1 Status LEDs

Front View

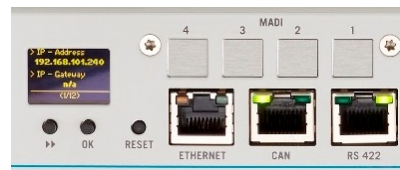


The ETHERNET, CAN and RS422 ports include a number of LEDs which can be useful.

| | |
|-----------------|--|
| ETHERNET | LED 1 (left): yellow, lit = valid network link. LED 2 (right): green, flashing = data transfer. |
| CAN | LED 1 (left): green, flashing = data received. LED 2 (right): green, flashing = data transmitted. |
| RS422 | LED 1 (left): green, flashing = data transfer. LED 2 (right) System Run LED : green, flashing = the control system has booted and is running normally. |

10.2.2 Service Mode

Front View



The Compact Engine can be booted in service mode to perform diagnostics.

1. Power off the device.
2. Press and hold the two buttons to the right of the status display – marked >> and **OK** – and power on.

At the end of the boot-up, the status display shows that the unit is now in “boot” mode (in the bottom left-hand corner):



3. Press the >> button to page through the available diagnostics.
4. When you have completed your tests, you can return the device to normal operation by pressing the recessed **RESET** button.

Load Default Parameters

This page can be used to boot the unit with its factory default IP address and no audio or control system parameters. It provides a way of checking the basic operation if, for example, the system stops responding after a configuration change. The configuration remains in memory but is not loaded until the **Load Default Parm**s option is canceled.

1. Boot the unit in [service mode](#) and page through to **Load Default Parm**s:



2. Press the **OK** button to toggle between the **YES** and **NO** options, and select **YES**.
3. Power off and on the unit - the Compact Engine now boots with the default parameters loaded; this is shown on the status display:



You can now carry out any checks on your system using the default IP address.

The unit will continue to boot in default mode, until you reset the **Load Default Parm**s option. So repeat steps 1 to 3 but this time select the **NO** option (in step 2) to reinstate the stored IP address and configuration.

Memory Test

This page performs a memory test. You can view the results by opening a Telnet session from your control PC.

1. Boot the unit in [service mode](#) and page through to **Perform Memtest**:



2. Press the **OK** button to start the test.

The system performs the memory test and stores a log file.

3. To view the results, open a [Telnet session](#) and log in to the system.
4. Then type the command "**memtest**" and press Enter - a list of options are presented:

```

Telnet 192.168.101.240
Welcome to RTEMS RELEASE rtems-ss-20020301 (Motorola ColdFire/m5200/zxs)
COPYRIGHT (c) 1989-1999.
On-Line Applications Research Corporation (OAR).
running on (Motorola ColdFire/m5200)
login: rroooott
root
Password: t*o*~n*t*o*~n*
RTEMS SHELL (Ver.1.0-FRC):/dev/pty0. Jun 10 2008. 'help' to list commands.
pty0 [1] # mneemnttesst

memtest
memtest: command list
 1: Perform Memtest
 2: Last Test Results
22
Last Test Result: No Error
pty0 [1] # _

```

5. Type 2 to view the last test results.

Note that the memtest command is only valid while the unit is running in Boot Mode.

10.2.3 Replacing Defective Parts

The IO cards fitted to expansion slots 1 and 2 can be exchanged from the front of the unit, allowing fast replacement in the case of a hardware failure. Providing the card is of the same type and fitted to the same slot as the faulty card, the new card will immediately take over the same functions.

The MAD1 daughter board can be exchanged by removing the top cover.

You **MUST** disconnect the unit from its power source to perform these operations.

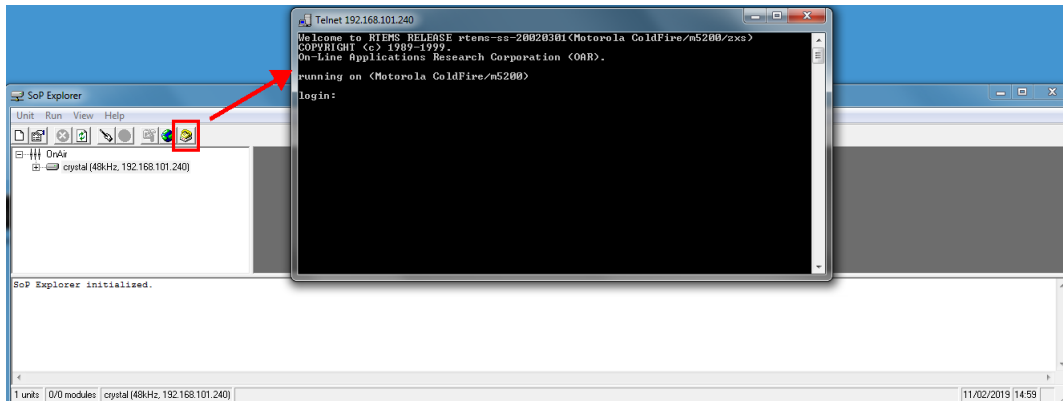
For more information on servicing other components, please contact your local Lawo representative or email support@lawo.com.

10.2.4 Opening a Telnet Session

To adjust certain parameters on the Compact Engine, you may need to open a telnet session to the control system.

1. Start by connecting your PC to the the Compact Engine control network.
2. Open SoP Explorer, select the system you wish to connect to, and then click on the "run telnet application" icon:

SoP Explorer - run Telnet:



If the telnet window does not appear, then the "Telnet Client" option may be disabled in Windows. This can be remedied by turning on Telnet Client in your Windows Control Panel.

If the Telnet Client option is activated and a Telnet session still does not appear, then try disabling any Anti-virus or Firewall applications running on the PC.

2. When prompted, enter the login name: "**root**" (press ENTER), and password "**tomtom**" (press ENTER).

The session opens, and you will see the command prompt for the control system.

3. Now follow the specific instructions for the task you wish to perform.

The telnet password can be changed from the Web UI (via the System -> Control tab) in Administrator mode.

10.2.5 Opening a Connection to the Serial Port

In some cases, you will need to make a direct connection to the **RS 422** serial port, otherwise known as the "console" port.

1. Install a suitable ssh/telnet client on your computer. We recommend using **Tera Term Pro Web 3.1.3**, a free ssh/telnet client for Windows, which can be downloaded from www.ayera.com/teraterm/
2. Connect your PC directly to the **RS 422** port on the Compact Engine's front panel.

A suitable cable is delivered with every unit (article number 485-0700-000). This provides a RJ45 connector (for the Compact Engine) and a Sub D connector (for the PC).

If your PC does not support a Sub D connector, then you will need to provide a serial to USB converter such as the one shown below.

Serial to USB Adapter



3. Set up the Serial connection for the COM port using the following credentials.
 - Speed: 115200 baud
 - Data bits: 8
 - Stop bits: 1
 - Parity: none
 - Flow control: none
4. Now follow the specific instructions for the task you wish to perform.

10.3 Control Surface Procedures

10.3.1 The Special Functions Mode

Each of the control surface modules offers a “special functions” mode. This can be used to adjust system settings and test the module's components (lamps, buttons, etc.)

Double-click on the links below to open the special functions mode documentation (as a pdf):

- [crystal Fader Module SF mode](#)
- [crystal Monitor Module SF mode](#)

10.3.2 Replacing Defective Parts

The CAN bus is hot-pluggable which means that the control surface can be connected and disconnected during uptime. This allows fast replacement of a frame in the case of a hardware failure. Providing the replacement frame is set to the correct CAN bus addresses, it will immediately take over the same functions as the exchanged frame.

10.4 Cleaning the Devices

Lawo radio products are made from a variety of different materials, and each material might have specific cleaning requirements. Therefore, a general allowance for disinfection of product surfaces with disinfectants containing alcohol cannot be given.

Our console surfaces and panels are not entirely approved for treatment with chemical cleaning agents and disinfectants. Component surfaces and electronics can be permanently damaged by treatment with such agents and the lifespan can be dramatically shortened. Please note that some substances can lead to discoloration of surfaces.

Lawo is not responsible for damage caused by unauthorized use of disinfectants on radio products and console surfaces.

This is a general instruction and recommendation for cleaning that applies to all Lawo radio products.

- Before you clean the device, unplug all external power sources.
- Clean the device with a soft cloth, dipped lightly in warm to hot soapy water.
- Do not use any liquid cleaning agents or spray cleaners which may contain flammable materials.
- Do not get moisture into any openings.
- Do not use aerosol sprays, bleaches, or abrasives.
- Do not spray cleaners directly onto the item.

The above information and our technical application advice are given to the best of our knowledge.

10.4.1 Cleaning the Control Surface

To clean the control surface please use a cleaning cloth with the following properties:

- Antistatic
- Fluff-free
- Without emery pieces

DO NOT spill liquids into any system components!

DO NOT clean the mixing console with sharp instruments!

11. Appendices

This chapter includes further information which you may find useful.

Topics include:

- [Part Numbers](#)
- [System Reference Levels](#)
- [Connector Pin-Outs](#)
- [crystal Surface Power Supply](#)
- [Compact Engine Power Supply](#)
- [Advanced Licensing Features](#)

11.1 Part Numbers

| System Component | | Part Number |
|----------------------------|--|-------------|
| crystal Surface Frames | 4-fader frame | 952/41 |
| | 8-fader frame | 952/42 |
| | 12-fader frame | 952/43 |
| | 12-fader split-frame | 952/44 |
| | 16-fader frame | 952/45 |
| crystal Surface Components | Fader Module | 951/41-10 |
| | Central (Monitor) Module | 951/41-20 |
| crystal Compact Engine | Main Frame | 952/30 |
| | RAVENNA IO Card (front expansion slot) | 952/38 |
| | LINE IO Card (front expansion slot) | 952/31 |
| | AES IO Card (front expansion slot) | 952/32 |
| | 12V DC power supply | 955/50-80 |

11.1.1 Data Sheets

Further technical information can be found in the product data sheets. The system part numbers will help you locate the data sheets for the main system components.

All documentation is available from the **Downloads** area at www.lawo.com (after **Login**).

11.2 System Reference Levels

| | DIN | SMPTE |
|---------------------------|----------|---------|
| Relative System Level | - 27 | - 38 |
| Analog Reference Level | 15 | 24 |
| Operating Level (analog) | +6 dBu | + 4 dBu |
| Operating Level (digital) | - 9 dBFS | -20dBFS |

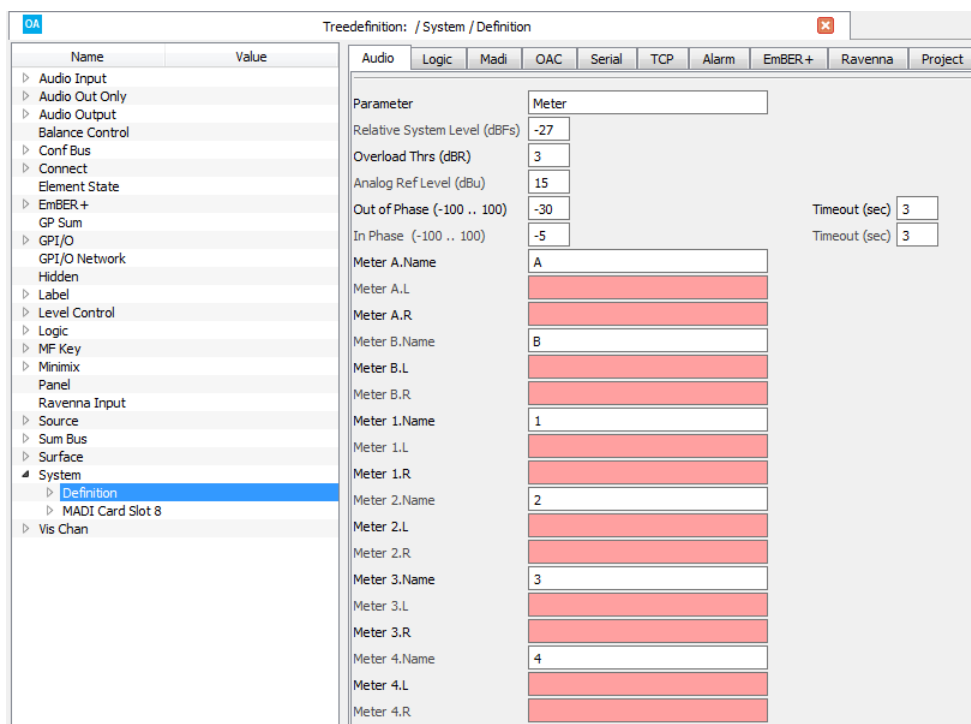
The **Relative System Level** and **Analog Reference Level** are options defined in the configuration. They combine to set the operating levels (analog and digital) for the system.

With **Relative System Level** (dBFS) you define the relative working point internally within the system. This value can be calculated with the formula "RSL = - digital headroom - 18" or "RSL = working point -18dB".

For example, the working point (0 dBr) for the ARD (German Broadcasters' Network) is at -9 dBFS. From this follows a **Relative System Level** (dBFS) of -27. Note that the working point is important as dynamics and limiter modules refer to this value. When the threshold value is set to 0 dB, the absolute level equals the working point.

If required, the **Relative System Level** and **Analog Reference Level** can be edited using the ON-AIR Designer. Start by opening the existing configuration, and then edit the **Relative System Level (dBFS)** and **Analog Ref Level (dBu)** options in the 'Tree Definition' (shown below).

ON-AIR Designer Tree Definition: "System -> Definition -> Parameter = Meter"



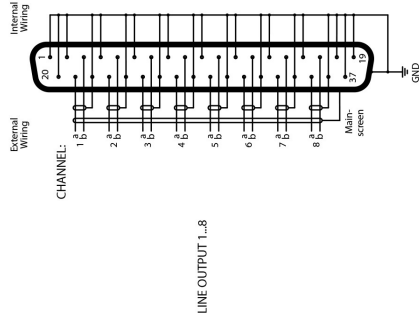
The screenshot shows the 'Treedefinition: / System / Definition' window in ON-AIR Designer. The left pane shows a tree view with 'System' expanded to 'Definition'. The right pane shows the configuration for the 'Meter' parameter. The 'Relative System Level (dBFS)' is set to -27 and 'Analog Ref Level (dBu)' is set to 15. There are also fields for 'Out of Phase' and 'In Phase' with associated 'Timeout (sec)' values of 3. Below these are fields for defining four meters (A, B, 1, 2, 3, 4) with their respective L and R channel labels.

Then save and transfer the edited configuration to the DSP Core. For more information about the configuration tool, please see the "ON-AIR Designer User Guide". This is available from the **Downloads** area at www.lawo.com (after **Login**).

11.3 Connector Pin-Outs

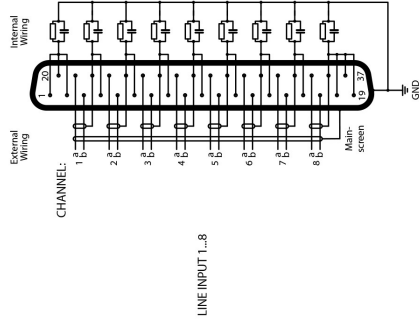
LINE OUTPUT

D-Sub 37p male Connector View



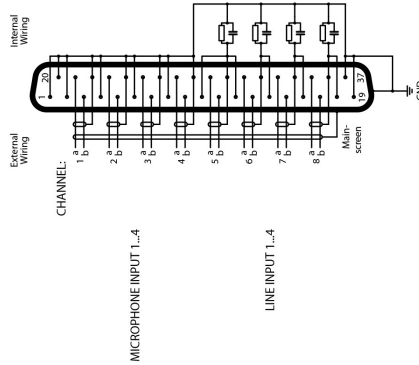
LINE INPUT

D-Sub 37p female Connector View



MIC/LINE INPUT

D-Sub 37p female Connector View



CAN (CAN BUS INTERNALLY TERMINATED)

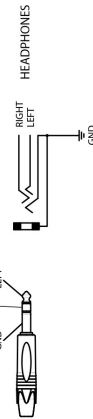
| PIN No. | FUNCTION |
|---------|----------|
| 1 | Low |
| 2 | High |
| 3 | Bus Term |
| 4 | GND |
| 6 | n.a. |
| 7 | n.a. |
| 8 | n.a. |

SERIAL RS422

| PIN No. | BA5/NTP (1) | DEBUG (2) |
|---------|-------------|-----------|
| 1 | n.a. | Tx+ |
| 2 | n.a. | Tx- |
| 3 | n.a. | Rx+ |
| 4 | n.a. | Rx- |
| 6 | n.a. | Rx- |
| 7 | n.a. | Rx+ |
| 8 | n.a. | n.a. |

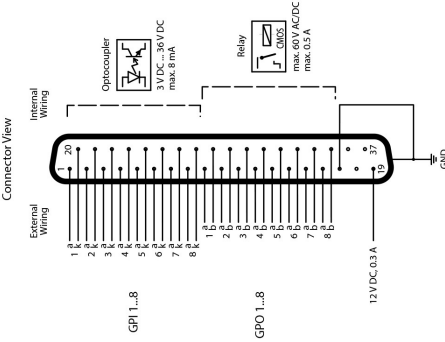
HEADPHONES

6.35 mm Stereo Jack Connector View



GPI

D-Sub 37p female Connector View



ATTENTION!
For an inductive load, please use a self-induction recuperation diode.

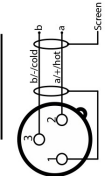
WARNING

WCLK

WCLK INPUT INTERNALLY TERMINATED 75 Ω

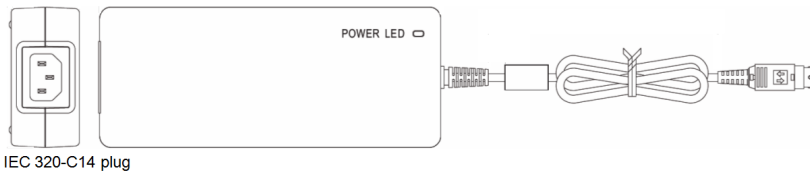
WCLK OUTPUT IMPEDANCE 75 Ω

XLR WIRING



11.4 crystal Surface Power Supply

12V DC Power Supply (SP4851209)



DC Plug Pinning

| PIN No: | FUNCTION |
|---------|----------|
| 1 | + 12 VDC |
| 3 | + 12 VDC |
| 2 | GND |
| 4 | GND |

Dimensions and Weight

| Parameter | Conditions | | Unit |
|-----------------|--------------|------|------|
| Mechanical data | | | |
| Width | | 72 | mm |
| Height | | 35 | mm |
| Length | | 175 | mm |
| Weight | | 670 | g |
| Cable length | without plug | 1200 | mm |

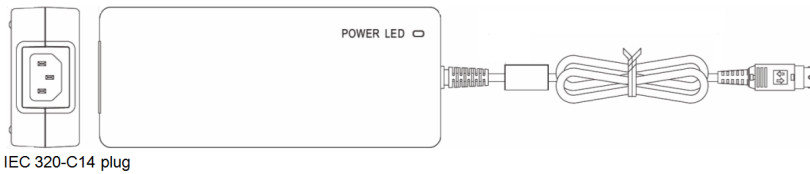
Electrical Specification

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|--|--|------|------|-----------------|
| Input Voltage | | 100 | | 240 | V _{AC} |
| Frequency | | 47 | | 63 | Hz |
| Input Current | | 1.1 | | | A _{AC} |
| Inrush Current | cold start at 25°C full Load | 30A/100V _{AC} 60A/240V _{AC} | | | A _{AC} |
| Efficiency | at 115 V _{AC} & 230 V _{AC} | 83 | | | % |
| Output Voltage | | 12±5% | | | V _{DC} |
| Output Current | | | | 3.3 | A _{DC} |
| Leakage Current | | <3.5 | | | mA |

11.5 Compact Engine Power Supply

12V DC Power Supply (955/50-80)

DC Plug Pinning



| PIN No: | FUNCTION |
|---------|----------|
| 1 | + 12 VDC |
| 3 | + 12 VDC |
| 2 | GND |
| 4 | GND |

Dimensions and Weight

| Parameter | Conditions | | Unit |
|-----------------|--------------|------|------|
| Mechanical data | | | |
| Width | | 72 | mm |
| Height | | 35 | mm |
| Length | | 175 | mm |
| Weight | | 670 | g |
| Cable length | without plug | 1200 | mm |

Electrical Specification

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|------------|--|------|------|-----------------|
| Input Voltage | | 85 | | 264 | V _{AC} |
| Frequency | | 47 | | 63 | Hz |
| Input Current | | 1,85A/115V _{AC} 1A/230V _{AC} | | | A _{AC} |
| Inrush Current | | 120A/230V _{AC} | | | A _{AC} |
| Efficiency | | 89 | | | % |
| Output Voltage | | 12±5% | | | V _{DC} |
| Output Current | | | | 11.5 | A _{DC} |
| Leakage Current | | | | 0,75 | mA |

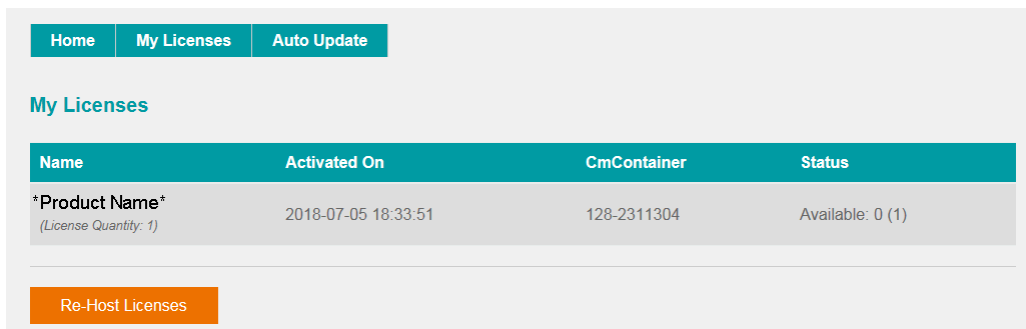
11.6 Advanced Licensing Features

This section describes the more advanced features of the CodeMeter Runtime licensing system.

11.6.1 Re-Hosting a License

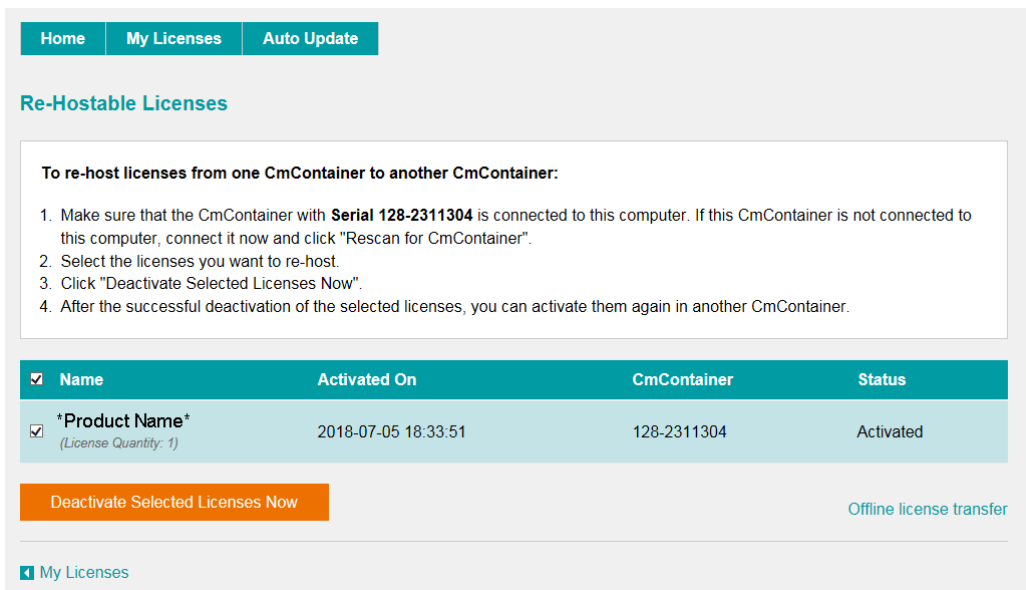
To move a license from one Cm container to another, you will need to re-host the license as follows. This requires you to first de-activate the license from its existing Cm container, and then choose the new storage container.

1. Follow the first two steps from the [online activation](#) method:
 - Open the 'Lawo License' web browser page at <https://licenseportal.lawo.com>.
 - Copy your license ticket number - this is the 25 number code - into the **Ticket** field and select **Next**.
2. At the "My Licenses" summary window, select **Re-Host Licenses**:



| Name | Activated On | CmContainer | Status |
|--|---------------------|-------------|------------------|
| *Product Name* <small>(License Quantity: 1)</small> | 2018-07-05 18:33:51 | 128-2311304 | Available: 0 (1) |

3. Make sure that the Cm container is connected to the computer, select the licenses you wish to re-host and select **Deactivate Selected Licenses Now**.



To re-host licenses from one CmContainer to another CmContainer:

1. Make sure that the CmContainer with **Serial 128-2311304** is connected to this computer. If this CmContainer is not connected to this computer, connect it now and click "Rescan for CmContainer".
2. Select the licenses you want to re-host.
3. Click "Deactivate Selected Licenses Now".
4. After the successful deactivation of the selected licenses, you can activate them again in another CmContainer.

| <input checked="" type="checkbox"/> | Name | Activated On | CmContainer | Status |
|-------------------------------------|--|---------------------|-------------|-----------|
| <input checked="" type="checkbox"/> | *Product Name* <small>(License Quantity: 1)</small> | 2018-07-05 18:33:51 | 128-2311304 | Activated |

Wait for a few seconds - a confirmation pop-up appears once the de-activation is successful.

You can follow steps 3 to 7 from the [online](#) activation method, or perform an [offline](#) license transfer, to activate the license using a new storage container.

11.6.2 Activating a License Offline

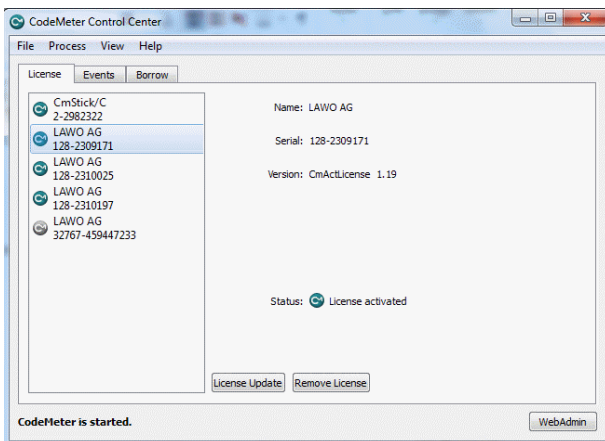
If your PC has no internet access, then you can activate a software license offline. This method involves three stages:

- **Create a license request file** - for the Cm storage container. Then copy the file onto a computer with internet access.
- **Activate the license** - using the 'Lawo License' web portal, copy the license update file back to the original computer.
- **Import the license update file** - to the Cm storage container.

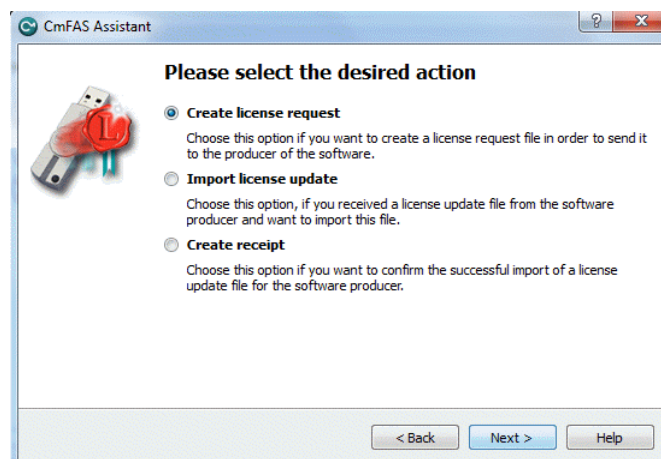
Creating the License Request File

On the computer you wish to license:

1. Open the '[CodeMeter Control Center](#)' (by clicking on the Cm taskbar icon), and select the container you wish to use for the license storage.
2. If the container is empty, select **Activate License**. Or, if the container already holds an active license, select **License Update**. This starts the 'CodeMeter Field Activation Service (CmFAS) assistant':

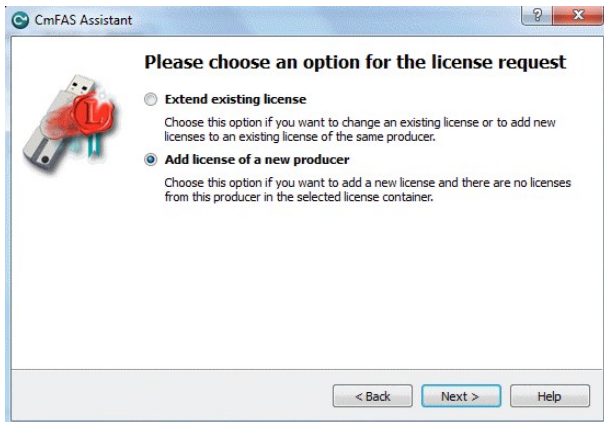


3. Select **Next:** and then **Create license request:**



At this stage, there are two additional steps (to add the correct firmcode) if you have selected a **CmStick** container. Enter the following Lawo FirmCode to create the license request file:

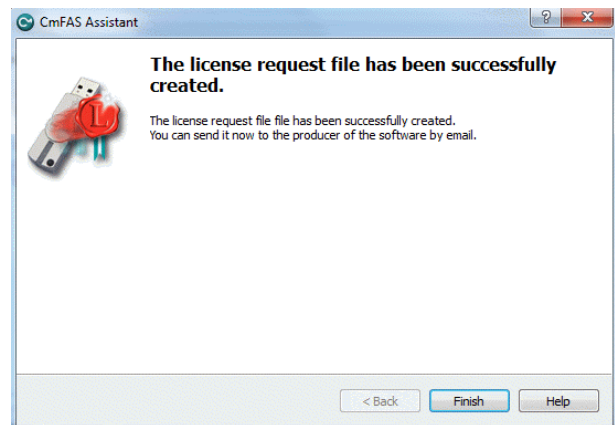
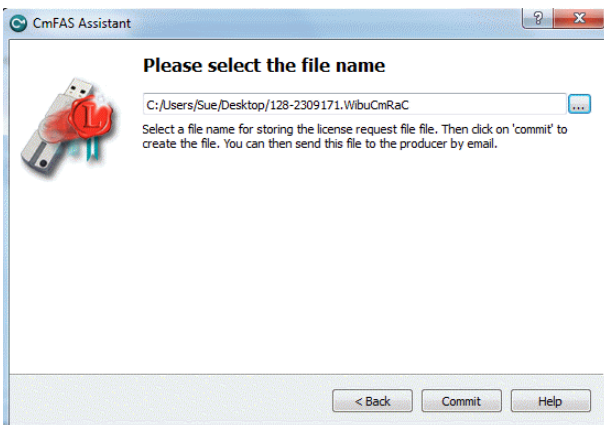
Select Add license of a new producer



Enter the Lawo FirmCode = 102037



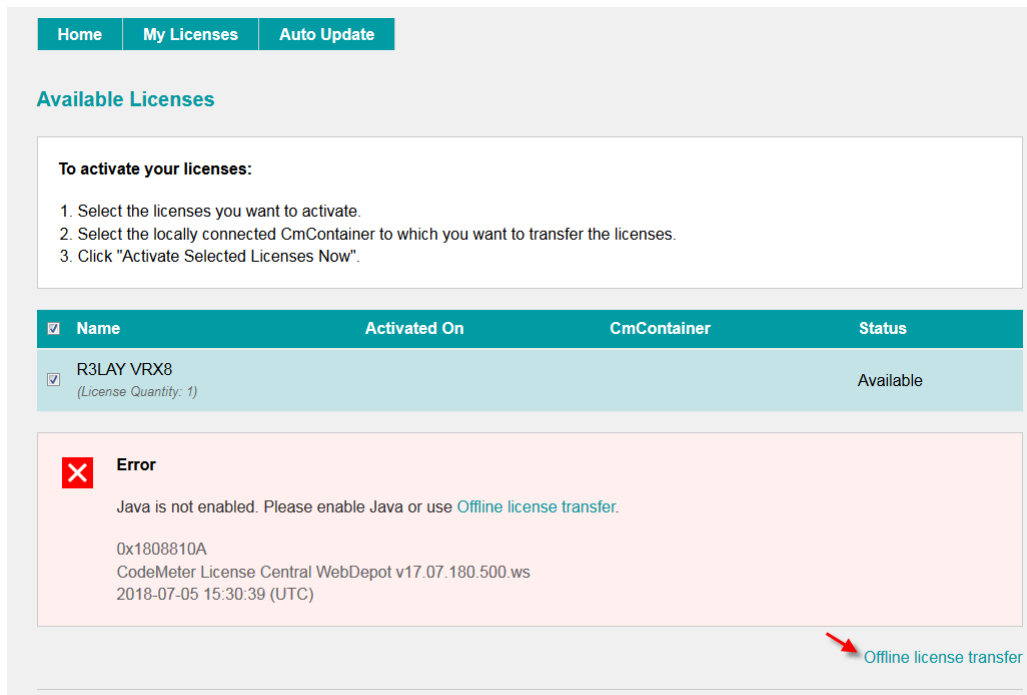
4. Select **Next**, and using Windows Explorer, enter a file path for the license request file. Choose somewhere easy to find, such as the Desktop. Then select **Commit** to create the request file:



5. Select **Finish** and copy the request file onto a computer with internet access. You will need both the license request file and the 25-digit ticket number (received with your license purchase).

Activating the License

1. On a computer with internet access, follow the first four steps from the [online activation](#) method:
 - Open the 'Lawo License' web browser page at <https://licenseportal.lawo.com>.
 - Copy your license ticket number - this is the 25 number code - into the **Ticket** field and select **Next**.
 - When your license is displayed, select **Activate Licenses** to continue.
 - Select the storage method for your license - either USB dongle or single computer.
2. At the **Available Licenses** page, select **Offline license transfer** to continue:



Home My Licenses Auto Update

Available Licenses

To activate your licenses:

1. Select the licenses you want to activate.
2. Select the locally connected CmContainer to which you want to transfer the licenses.
3. Click "Activate Selected Licenses Now".

| <input checked="" type="checkbox"/> | Name | Activated On | CmContainer | Status |
|-------------------------------------|--|--------------|-------------|-----------|
| <input checked="" type="checkbox"/> | R3LAY VRX8 <small>(License Quantity: 1)</small> | | | Available |

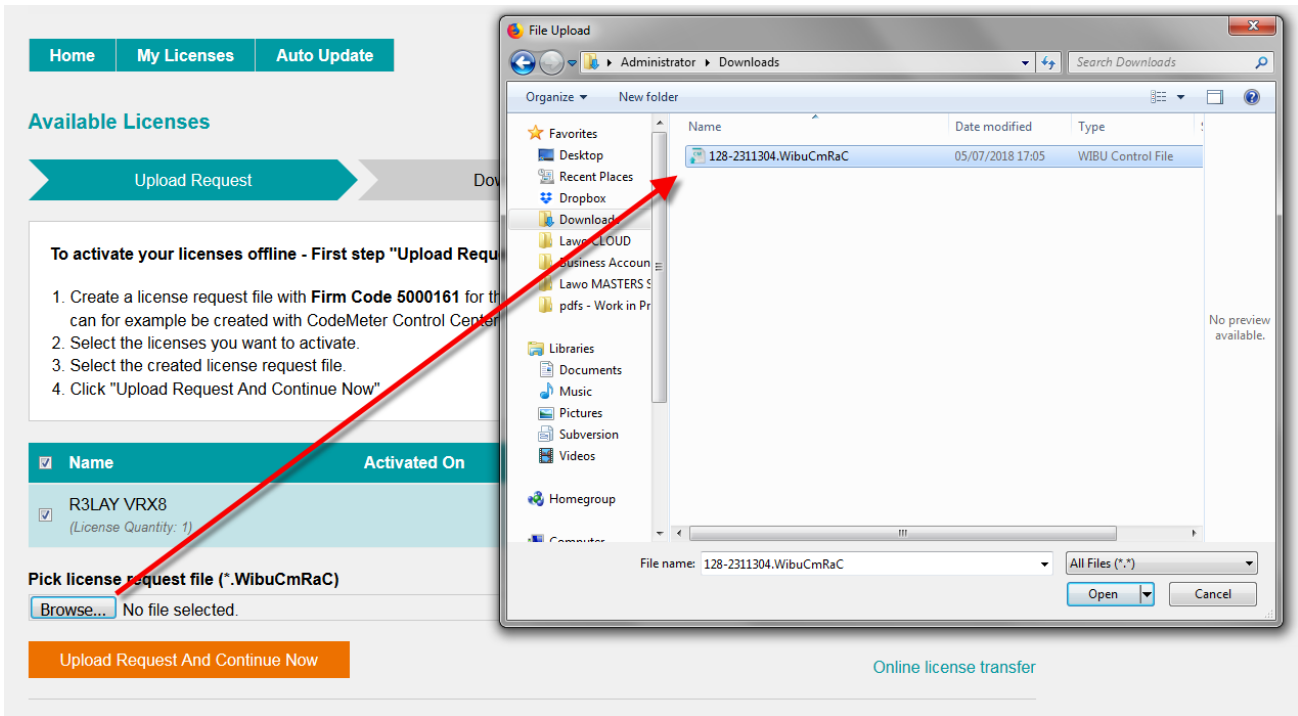
Error

Java is not enabled. Please enable Java or use [Offline license transfer](#).

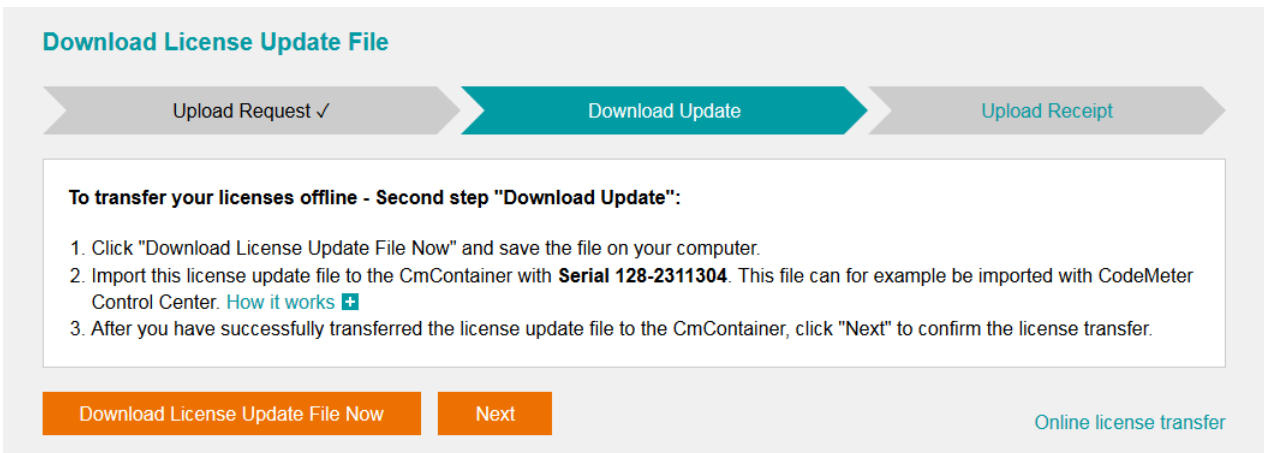
0x1808810A
CodeMeter License Central WebDepot v17.07.180.500.ws
2018-07-05 15:30:39 (UTC)

[Offline license transfer](#)

3. On the next page, select the license(s) you wish to activate, select **Browse...** and, using Windows Explorer, choose the request file (created earlier):



4. Then select **Upload Request And Continue Now** - the license request is processed and, if successful, you will have the option to Download the update:

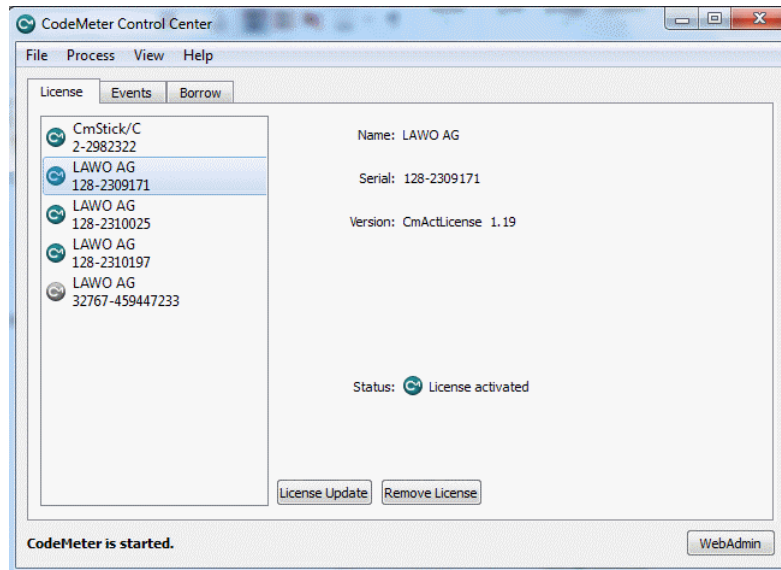


5. Select **Download License Update File Now** and, when prompted, choose the **Save** file option - the file is downloaded.

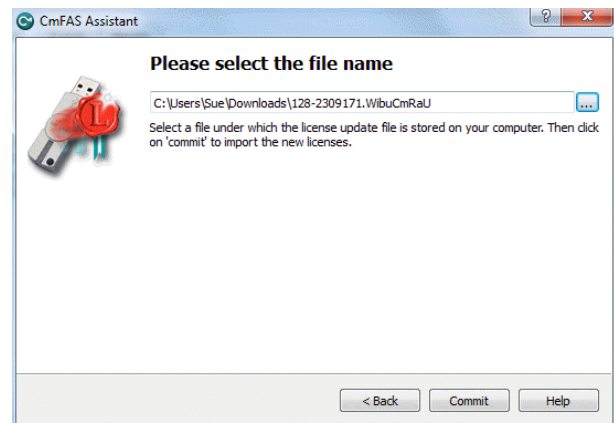
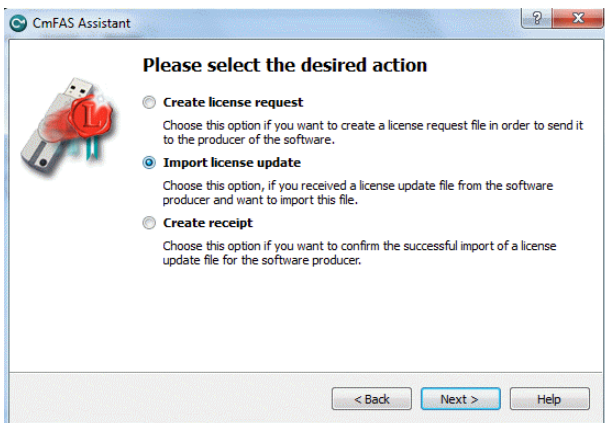
6. Copy the License Update file back to the original PC.

Importing the License Update

1. On the original computer re-open the 'CodeMeter Control Center' and select the Cm container for the license update. Note that this must be the same container as the one selected earlier (during the License Request).



2. Select **License Update** and follow the instructions given by the 'CmFAS Assistant' - when prompted, select Import License update and choose the update file (downloaded from the License portal):

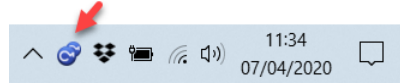


3. Select **Commit** to action the update - the license is activated and you can close the 'CodeMeter Control Center'.
4. You can now return to your Lawo application or install your USB license dongle - all licensed features should be available.

11.6.3 The CodeMeter Control Center

The 'CodeMeter Control Center' is used to manage the license containers and perform a backup or restore.

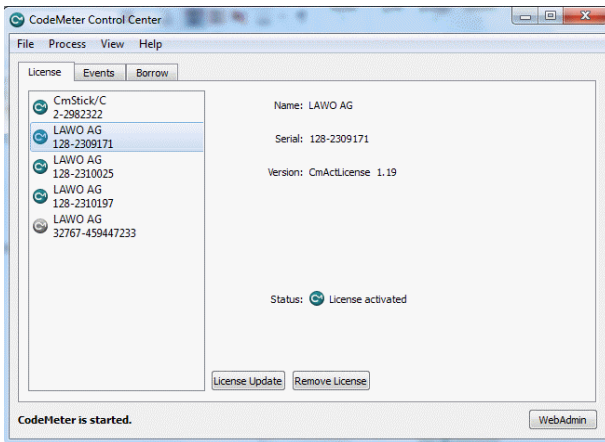
1. Click on the Windows taskbar Cm icon to open the 'CodeMeter Control Center' - the icon may be hidden from view or vary in color (depending on your taskbar configuration).



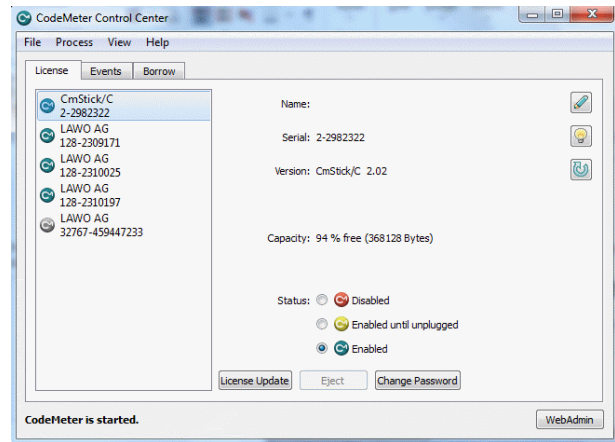
The 'CodeMeter Control Center' shows all the Cm containers which can be used for license storage.

A new local computer container is created each time you run the **CodeMeter Runtime** install wizard. Therefore, if you have installed multiple Lawo products or software versions, you will see several **LAWO AG** containers. If a USB dongle is connected, you will see a container labelled **CmStick**.

Local Computer Container (LAWO AG)



USB Dongle Container (CmStick)

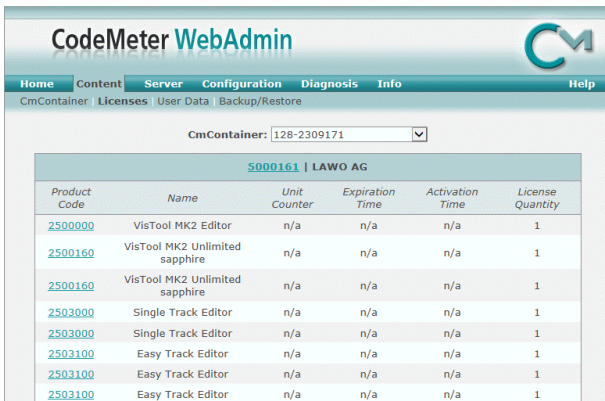


The **Serial** numbers identify each container. The icon colours indicate: green = license activated; grey = container is empty; red = license deactivated.

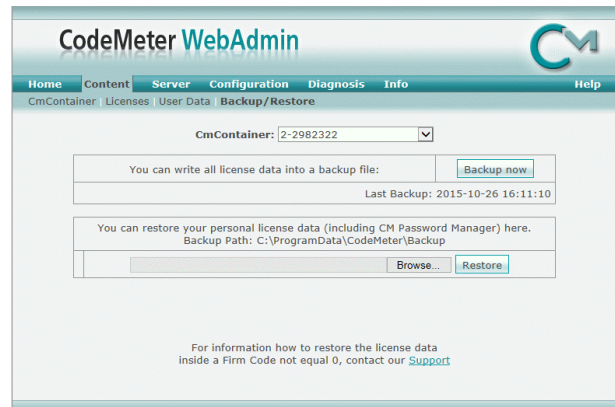
A single Cm container can contain multiple licenses - simply select the same container during the [activation](#) process.

2. Select **WebAdmin** (bottom right) to open the WebAdmin portal in your default browser. The portal has many functions including license interrogation, and backup/restore functions for licenses stored on a **CmStick** (USB Dongle):

WebAdmin Content Cm Container



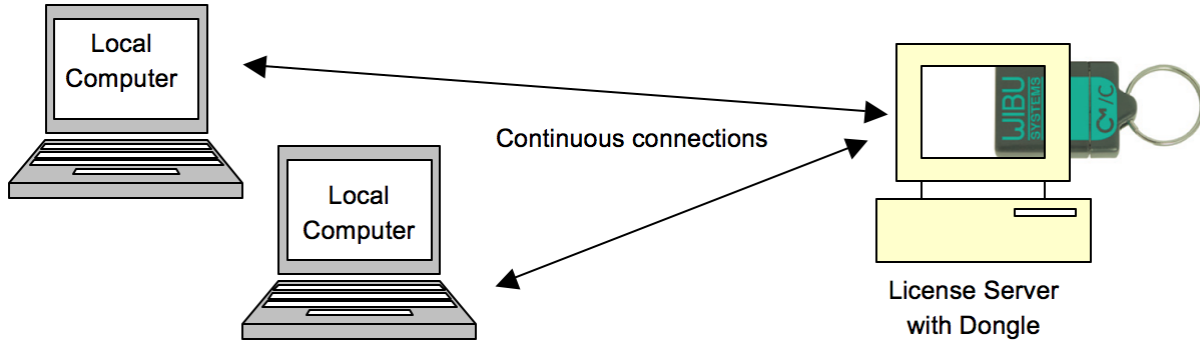
WebAdmin Backup/Restore



For further information, please refer to the **CodeMeter Runtime** documentation at wibu.com.

11.6.4 License Configuration via a Central Server

This license storage method can be used to administrate licenses centrally within a local network. For example, when starting a Lawo application such as **VisTool**, the local computer asks the server to borrow the relevant license. The license is then used by the **VisTool** client until the application is closed. On closing, the license is handed back to the server where it may then be used by a different **VisTool** client.



Preparing the License Server

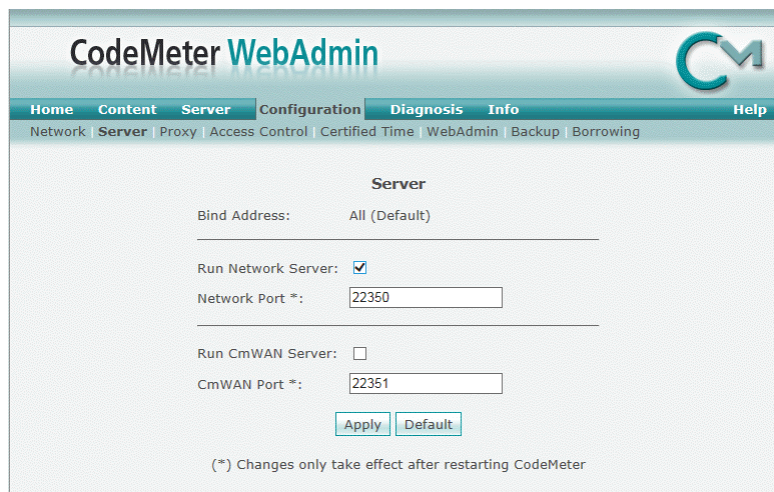
1. First, install the **Codemeter Runtime** software (Version 5.10 or above) on the central server. (Or, on a virtual machine on the server).

The latest release of CodeMeter Runtime can be downloaded from WIBU systems at wibu.com.

2. Activate all licenses in the usual manner.

If a virtual machine is being used, set up a connection between the virtual machine and USB dongle.

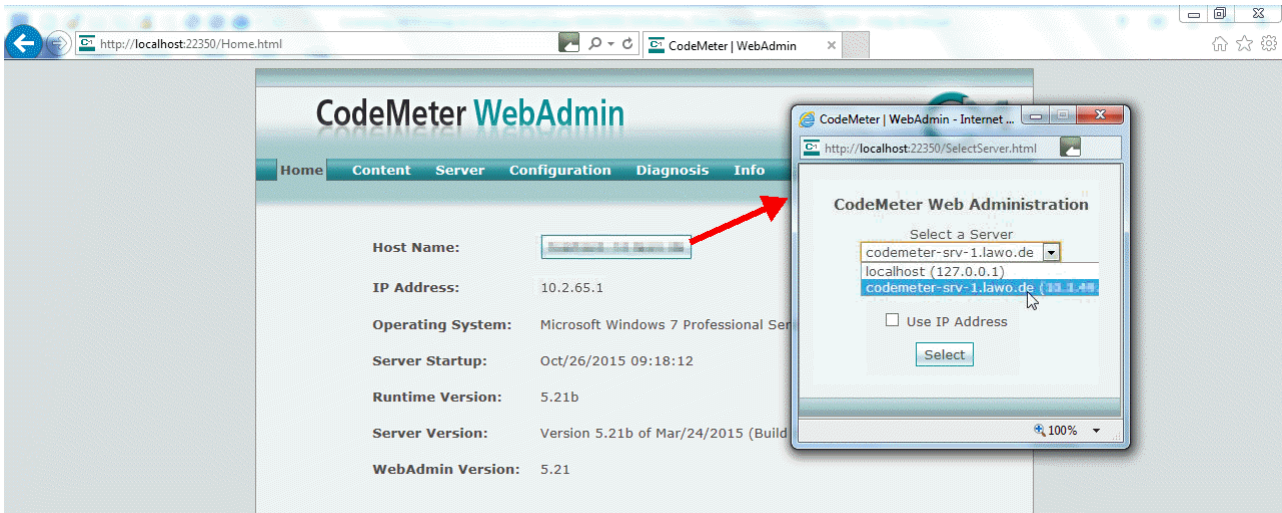
3. Open the [CodeMeter Control Center](#) and select **WebAdmin**.
4. Under **Configuration -> Server**, select the **Run Network Server** checkbox:



5. Click **Apply** and restart the **CodeMeter Runtime** software.

Preparing the Clients

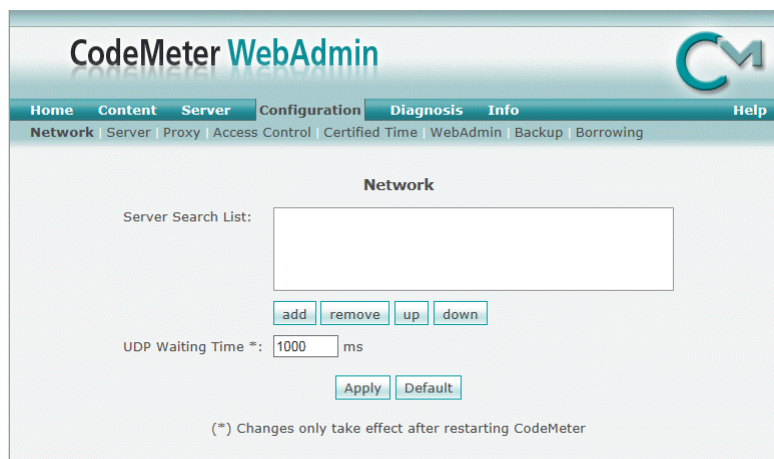
1. Install the **Codemeter Runtime** software (Version 5.10 or above) on each of the client computers.
2. Connect the clients (and server) to the network - on startup, the **CodeMeter Runtime** software sends a broadcast message across the network to find all license servers.
3. On each client computer, open the [CodeMeter Control Center](#) and select **WebAdmin**.
4. From the **Home** page, select the name of the computer - a dialogue box should appear listing all the available license servers:



5. Choose the correct server from the drop-down list and click on **Select**.

If the license server is not found, then your firewall or network policy may not allow messages to be broadcast. In this case, you will need to add the server's IP settings to the search list, manually, as follows:

Under **Configuration** -> **Network**, add the correct IP settings into the **Server Search** list:



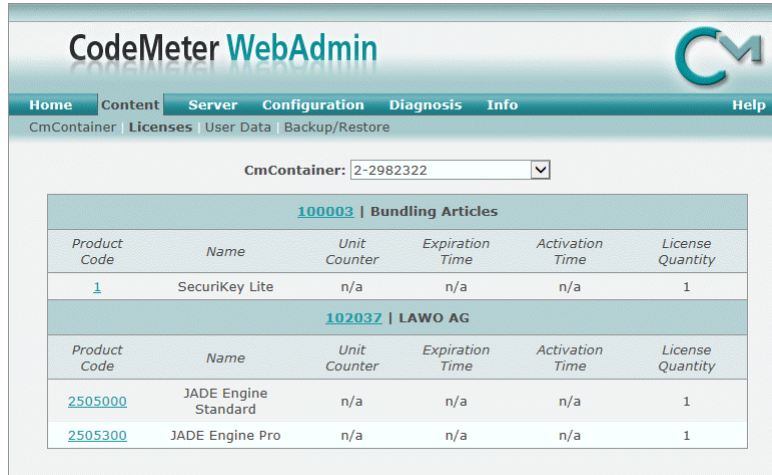
Click **Apply** and restart the **CodeMeter Runtime** software.

Note that once the **Server Search list** has an entry, all other license servers (announced automatically to the network) will be ignored.

Choosing a License

Once a connection to the license server is established, you can borrow one of the server licenses as follows:

1. On the client computer, open the [Codemeter Control Center](#) and select **WebAdmin**.
2. Under **Content** -> **Licenses**, choose the **CmContainer** (holding the server licenses) and select the desired license file:



If the licenses is in use, then a warning message appears.

You can check which licenses are available (free) by selecting **Server** and **Cluster**:

