DENSITÉ series

REF-1801
HD/SD Frame Reference Module
with Optional SPG
Guide to Installation and Operation

Miranda

A **BELDEN** BRAND

Electromagnetic Compatibility

This equipment has been tested for verification of compliance with FCC Part 15, Subpart B requirements for Class A digital devices.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This equipment has been tested and found to comply with the requirements of the EMC directive 2004/108/CE:

- EN 55022 Class A radiated and conducted emissions
- EN 61000-3-2 Harmonic current injection
- EN 61000-3-3 Voltage fluctuation and flicker limitations
- EN 61000-4-2 Electrostatic discharge immunity
- EN 61000-4-3 Radiated electromagnetic field immunity – radio frequencies
- EN 61000-4-4 Electrical fast transient immunity
- EN 61000-4-5 Surge immunity
- EN 61000-4-6 Conducted immunity
- EN 61000-4-11 Voltage dips, short interruption and voltage variation immunity

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REF-1801

Table of Contents

1 REF-1801 HD/SD Frame Reference Module

1.1 Introduction

The REF-1801 is a reference module that distributes a universal reference signal (URS) to all the cards within a Densité frame. It can also optionally generate two selectable reference signals for external use.

The unique URS concept provides significant advantages as it generates a digital reference signals and simplifies inter-format processing by using a unique reference signal for all video and audio frame rates.

The REF-1801 extracts timecode from the input as per the SMPTE-318 standard, which allows for perfect audio / video phasing. Other features include the ability to slave other Densité frames as well as advancing or delaying reference output signals

The REF-1801 should be installed in slot 10 of a Densité 2 or Densité 3 frame.
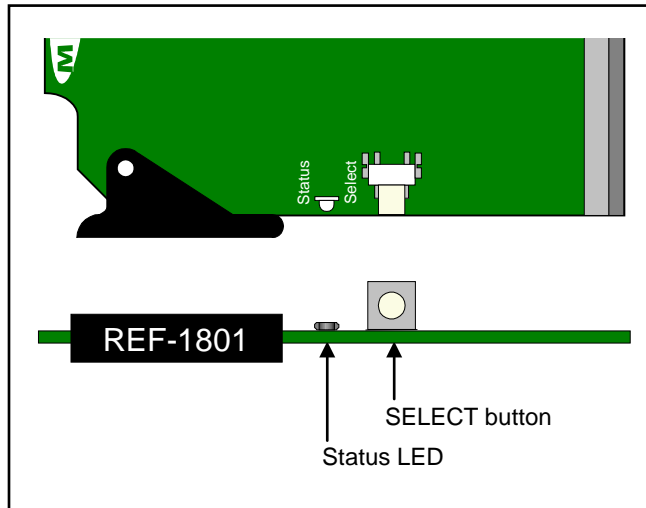
1.2 Features

- Digitally generated reference for intra-frame distribution
- Time code extraction and embedding
- Supports SMPTE 318M for perfect audio/video phasing
- Two fully-independent sync outputs (option)
- Easy control & monitoring

1.3 Block Diagram
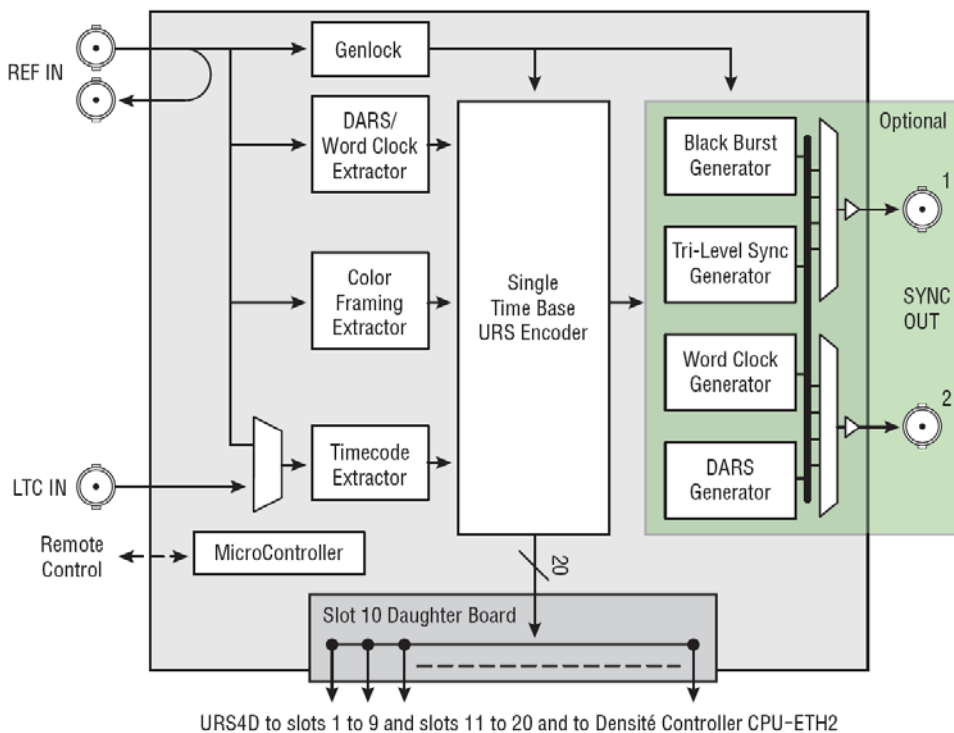
REF-1801 Functional; Block Diagram
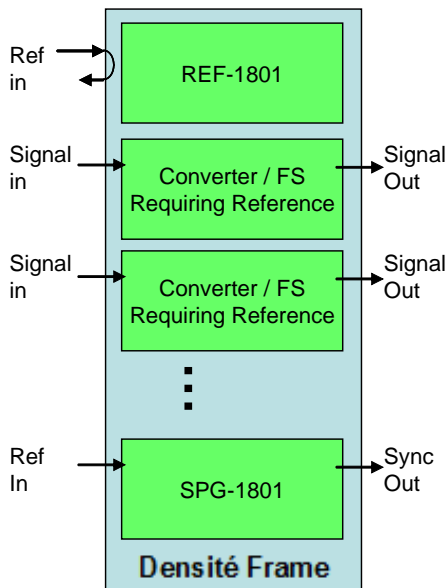
1.4   Card Front Edge Layout
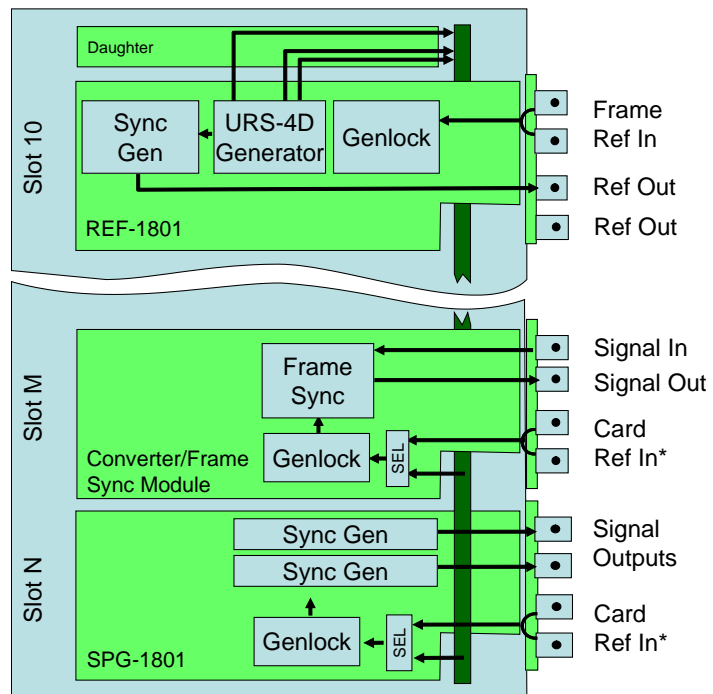

1.5   Applications

Application 1:

Referencing converters and frame sync modules

In this application, the REF-1801 accepts a reference input and generates a URS4D signal that is distributed to all Densité slots within the same frame.
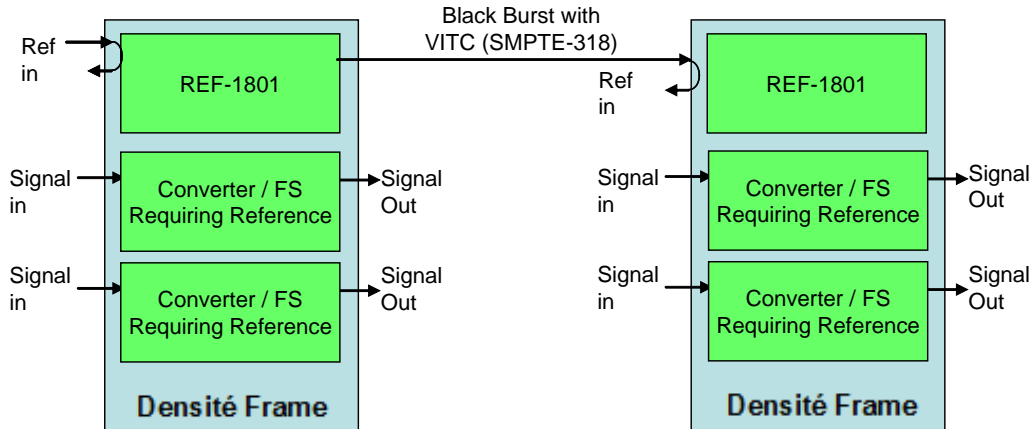

(overview)

(detailed view)

Application 2:

Slaving cards in a frame to another REF-equipped frame

In this application, the reference signal is distributed in order to slave another Densité frame. The ability to carry time code and SMPTE-318 information will allow the slaved frame to operate with the same A/V phasing information as the master frame.

Application 3:

Feeding 3rd party equipment that requires REF (e.g.: tri-level sync)

In this application, the REF-1801 card is used to generate a reference signal to feed 3rd party equipment. This might be very useful, especially when the 3rd party equipment needs a tri-level sync reference signal.
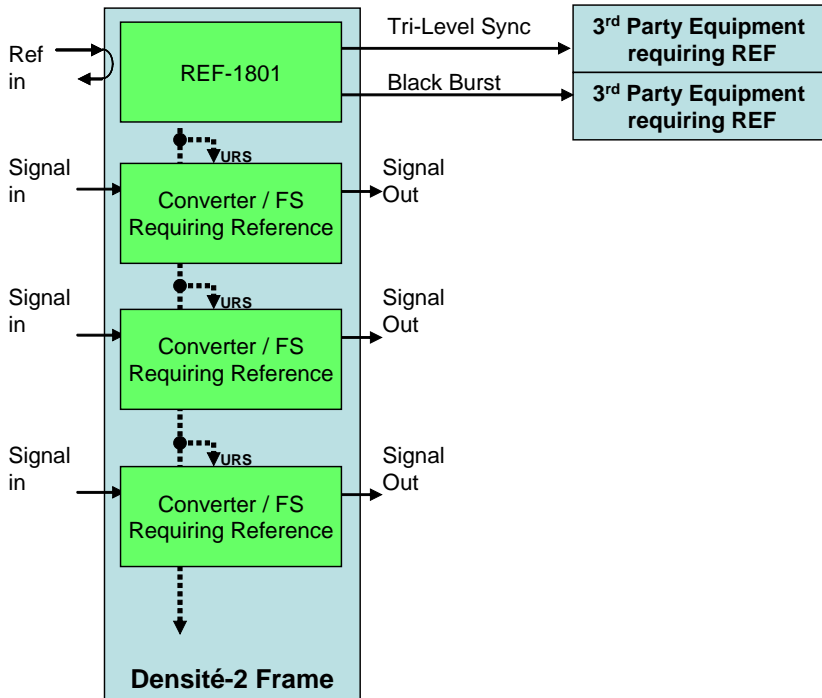
2   Installation

2.1   Unpacking

The following items should be included in the REF-1801 package:

- For Densité 2:
  - ➤ REF-1801 HD / SD Frame Reference Module
  - ➤ REF-1801-SRP rear panel

- For Densité 3:
  - ➤ REF-1801-3RU HD / SD Frame Reference Module
  - ➤ REF-1801-SRP-3RU rear panel

- User manual

2.2   Installation in the Densité frame

The REF-1801 must be mounted in a Densité 2 or Densité 3 frame. The installation includes both the REF-1801 module, and the rear panel module. It is not necessary to switch off the frame's power when installing or removing the card.

- ***The REF-1801 must be installed in slot 10 in the frame.***

Detailed instructions for installing cards and their associated rear panels in the Densité frame are given in the Densité Frame manual.

2.3   Connection

All connections are made on the rear panel:

- Connect the input reference signal to the BNC marked **REF IN**

    A loop-through is provided, which should be terminated if unused.

- Connect LTC time-code to the BNC marked **LTC IN**

- Two programmable sync outputs are available on the **SYNC OUT** BNC connectors *(only if the SPG option has been enabled)*
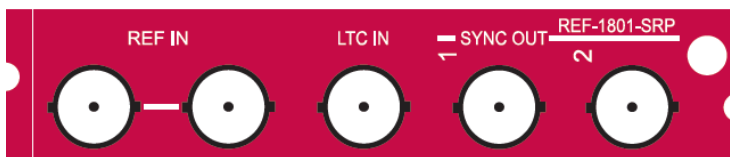

Figure 2.1   *REF-1801-SRP rear panel*

Operation

2.4   Control Options

The REF-1801 has two primary control interfaces:

- The local control panel attached to the Densité frame's controller
- Remote control using Miranda's iControl system

These will be explained in detail in the following sections.

2.5   Local control using the Densité frame control panel

Push the SELECT button on the REF-1801 card edge (see Section 1.4) to assign the local control panel to operate the REF-1801. Use the control panel buttons to navigate through the menu, as described below.

All of the cards installed in a Densité frame are connected to the frame's controller card, which handles all interaction between the cards and the outside world. There are no operating controls located on the cards themselves. The controller supports remote operation via its Ethernet ports, and local operation using its integrated control panel.

The local control panel is fastened to the controller card, and when installed is located in front center of the frame, positioned in front of power supplies. The panel consists of a display unit capable of displaying two lines of each 16 characters in length, and five pushbuttons.

The panel is assigned to operate any card in frame by pushing the SELECT button on the edge of that card. Pushing the CONTROLLER on the control panel selects the Controller card The STATUS LED on the selected card flashes yellow.
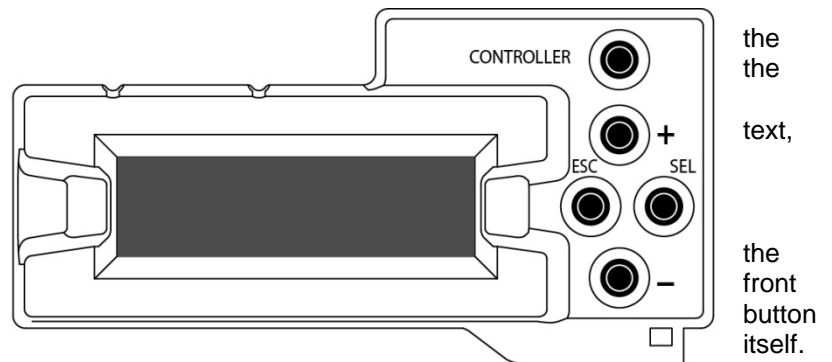
the the text, the front button itself.

The local control panel displays a menu that can be navigated using the four pushbuttons located beside the display. The functionality of the pushbuttons on the panel is as follows:

[CTRL]   Selects the controller card for status monitoring and adjustment

[+] [–]   Used for menu navigation and value modification

[SELECT]   Gives access to the next menu level. When a parameter value is shown, pushing this button once enables modification of the value using the [+] and [–] buttons; a second push confirms the new value

[ESC]   Cancels the effect of parameter value changes that have not been confirmed. Pushing [ESC] causes the parameter to revert to its former value.

Pushing [ESC] moves the user back up to the previous menu level. At the main menu, [ESC] does *not* exit the menu system. To exit, re-push the [SELECT] button for the card being controlled.

If no controls are operated for 30 seconds, the controller reverts to its normal standby status, and the selected card's STATUS LED reverts to its normal operating mode.

2.5.1 Status LED

The status monitor LED is located on the front card-edge of the REF-1801, and is visible through the front access door of the DENSITÉ frame. This multi-color LED indicates module status by color, and by flashing/steady illumination, according to the chart. The chart also indicates fault reporting for this card on the DENSITÉ frame's serial and GPI interfaces.

	Serial Report	GPI Report	Green	Yellow	Red	Flashing Red
Mode Freerun				✪		
No Signal					✪	
I/O Mismatch				✪		
No Time Code					✪	
Hardware failure						✪

✪ : Factory default.

NOTE: A "Flashing Yellow" Status LED indicates that the SELECT button on the front panel has been pushed.

2.5.2   Menu for local control

The REF-1801 has operating parameters which may be adjusted locally at the controller card interface. After pressing the SELECT button on the REF-1801 module, use the keys on the local control panel (described above) to step through the displayed menu and adjust the parameters. The menu is shown below.

STATUS

OUTPUT CONFIG*   * Available with SPG Option

      OUTPUT 1

            OUPUT FORMAT : OFF/ BLACK B. 59.94 / BLACK B. 50 / Tri-L 1080i59.94 / Tri-L 1080i50 /
                           Tri-L 720p59.94 / Tri-L 720p50 / DARS 48 kHz / WORD CLOCK 48 kHz

          VERTICAL   [-524, …. -2, -1, 0, 1, 2, ….   523, 524] (lines) *(525)*
                              [-624, …. -2, -1, 0, 1, 2, ….   523, 624] (lines) *(625)*
                              [-1124, ….-2, -1, 0, 1, 2, …, 1123, 1124] (lines) *(1080i)*
                              [-749, …. -2, -1, 0, 1, 2, …, 748, 749] (lines) *(720p)*

          HORIZONTAL   [0, 0.037, 0.064, …. 63,5] (us)   *(525)*
                              [0, 0.037, 0.064, …. 64]   (us)   *(625)*
                              [0, 0.013, 0.027, …. 29.67] (us)   *(1080i59.94)*
                              [0, 0.013, 0.027, …. 35.56] (us)   *(1080i50)*
                              [0, 0.013, 0.027, …. 22.24] (us)   *(720p59.94)*
                              [0, 0.013, 0.027, …. 26.67] (us)   *(720p50)*

      OUTPUT 2 (Same sub-menu as for *OUTPUT 1*)

REFERENCE   SOURCE   [AUTO, EXTERNAL, INTERNAL]
                 URS GEN MODE   [NORMAL, FREERUN]

TIME CODE   SOURCE   [AUTO, LTC, VITC, OFF]
                 PROCESSING   [NORMAL, PASS THROUGH]

CONFIG ALARMS   NO INPUT SIGNAL   ALARM LEVEL   [GREEN, YELLOW, RED, FLASH RED]
                                    ALARM REPORT [NONE, GPI]
                 NO TIME CODE   ALARM LEVEL   [GREEN, YELLOW, RED, FLASH RED]
                                    ALARM REPORT [NONE, GPI]
                 I/O MISMATCH*   ALARM LEVEL   [GREEN, YELLOW, RED, FLASH RED]
                                    ALARM REPORT [NONE, GPI]   * Available with SPG Option

VERSION   REF-1801: xxx

OPTIONS   SPG ON/OFF   Key: xx.xx.xx.xx

FACTORY DEFAULT   [RESTORE]

2.6   Remote control using iControl

The operation of the REF-1801 may be controlled using Miranda's iControl system.

- This manual describes the control panels associated with the REF-1801 and their use.
- Please consult the iControl User's Guide for information about setting up and operating iControl.

In iControl Navigator or iControl Websites, double-click on the REF-1801 icon to open the control panel.

2.6.1   The iControl graphic interface window

The basic window structure for the REF-1801 is shown in figure 3.1. The window identification line at the top gives the card type (*REF-1801*), and the slot number in which the card is installed in the Densité frame. On the left is a Status icon for the card.
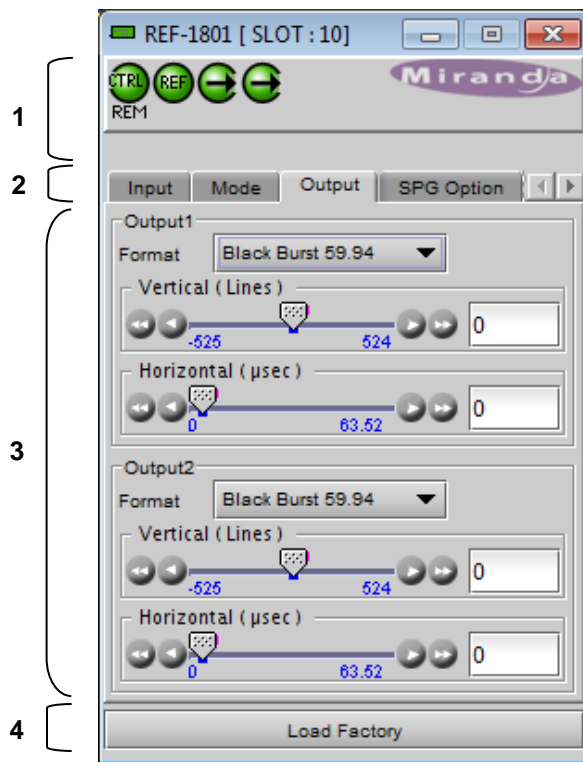
Figure 3.1 *REF-1801 iControl graphic interface window*

There are four main sections in the window itself, identified in figure 3.1:

1. The top section displays icons on the left. These icons report card communication status, input reference signal format and status, and output reference signal status.

Icon #   1   2   3   4

Move the cursor over an icon to see its current status in the message area below the icons. If there is an error status, the message will appear automatically. If there are multiple error messages, the display will cycle through them

- Mousing over the Reference Status icon will show the format of the input reference

Icon #	Indicates	appearance	interpretation
1	Card control status		Green if the card is controlled remotely Yellow when locally controlled
2	Input Reference status		Green if OK, Red if error detected
3	Output 1 Reference mismatch		Green if OK, Red if error detected
4	Output 1 Reference mismatch		Green if OK, Red if error detected

2. Tabs are provided to give access to the various controls.

- Single row of tabs, with arrow buttons to move along until desired tab is displayed.

Click on a tab to select it.

3. The contents of the selected tab, with operating controls and status monitors as required.

4. The Load Factory button.

Clicking this button will reset all REF-1801 parameters to factory-default values, overriding settings made in the control panels.

2.6.2   Input tab

Reference Source

The pulldown selects the reference source for this REF-1801. The choices are:

- **Auto** – Use the external reference if available; switch to the internal reference if the external reference is lost or unavailable.
- **External** – use the reference connected to the rear panel
- **Internal** – use the internal reference source

Time Code

The *Timecode Source* pulldown selects the source of timecode that will be inserted in the outgoing reference signals from this REF-1801. The choices are:

- **Auto** – Use LTC if available, if not, VITC.
- **VITC** – Extract timecode from the reference input
- **LTC** – Use the timecode connected to the LTC input on the rear panel.
- **OFF** – Do not insert timecode into the output reference signals.

The Timecode Processing pulldown offers two options:

- **Normal** – use the timecode selected by the *Timecode Source* pulldown as the output timecode source.
- **Pass through** – pass the timecode selected by the Timecode Source pulldown directly to the output without internal processing.
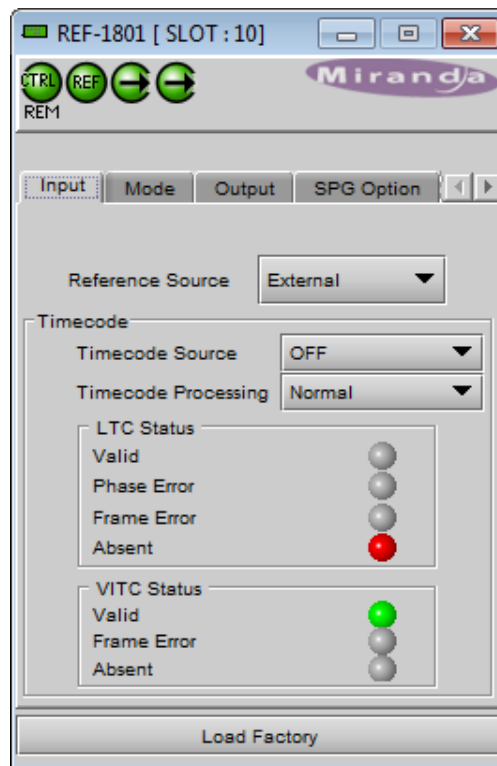
Figure 3.2   *Input tab*

> **NOTE: This mode is required for correct operation when the time code is not standard running time code, e.g. when it is counting down. Using this mode will result in a 1-frame delay in the time code as it passes through the REF-1801. When pass through mode is selected, no new input timecode alarms (frame error, phase error) will be flagged.**

The current status of timecode available at the REF-1801 input is shown in the *LTC Status* and *VITC Status* areas

- **Valid** (green icon): valid time code detected at the input.

- **Phase error** (red icon):
  SMPTE-12 specifies the phase relation between LTC and video. If the LTC received does not match this alignment window, the card will flag this error.

- **Frame error** (red icon):
  The time code must match the input reference frame rate. If not, an error is flagged.

- **Absent** (red icon): no time code detected at the input
  Note: The error detection algorithm uses the current reference format. So, when using internal reference, all information extracted from the input is out of phase, and the card may flag errors even if there are none.

2.6.3   Mode tab

URS (Universal Reference Signal) is a Miranda-proprietary reference that is used within a Densité frame. It is generated by the REF-1801 (which must be located in slot 10), and distributed to other cards in the frame via the frame's midplane.

URS Generation Mode

The pulldown allows selection of the operating mode of the URS generator in the REF-1801:

Normal – In normal mode, the URS signal generated contains only the synchronization signals that match the reference format used by the REF-1801. That is, if input is NTSC, only 29.97Hz synchronization signals are sent.

Free Run – If the free run mode is selected, all URS synchronization signals are generated, even the frame-rate-mismatched ones. So, in the same frame, some cards can work in 25Hz frame rate and other cards in 29.97Hz. The phase relation between these two frame rates will be arbitrary, thus the name "free run".
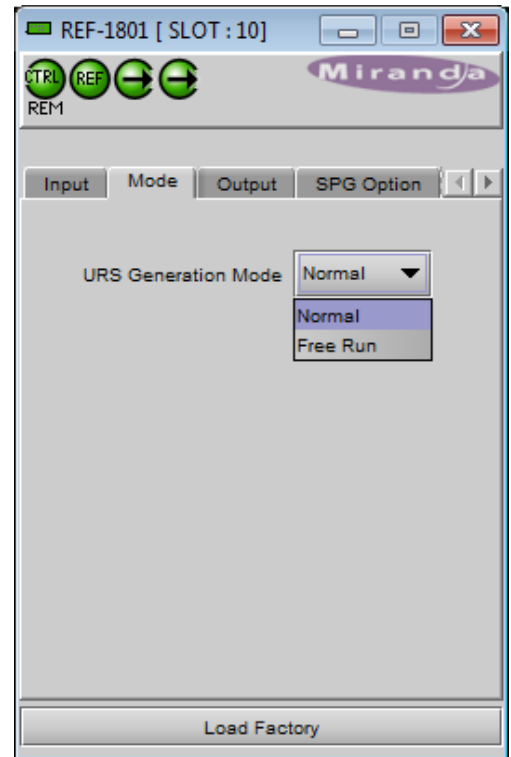

Figure 3.3 Mode tab

2.6.4   Output tab

The Output tab provides resources to configure the sync outputs that are enabled by the SPG option.

- The controls on this tab are not functional if the SPG option has not been enabled

Each of the two sync outputs can be configured independently.

Format – the pulldown selects the format of the sync output. Available choices are:

- Black Burst 59.94
- Black Burst 50
- Tri-Level 1080i59.94
- Tri-Level 1080i50
- Tri-Level 720p59.94
- Tri-Level 720p50
- DARS 48 kHz
- Word Clock 48 kHz

Note that not all of these output choices will be available at all times. The output formats available depend on the format of the reference input.

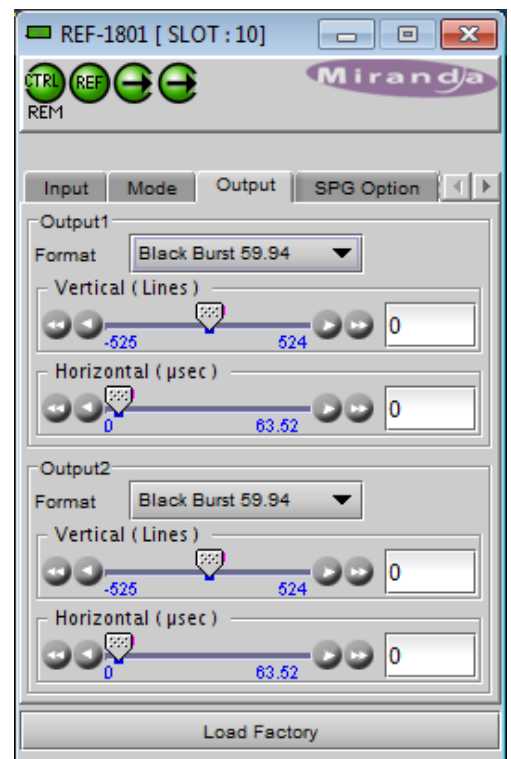- The following chart shows the relationship between reference input format and available output formats.

Figure 3.4   Output tab

Output	Black Burst		Tri-Level				DAR	Word Clock
Input	59.94	50	1080i59.94	1080i50	720p59.94	720p50	48 KHz	48 KHz
Black Burst 59.94	●		●		●		●	●
Black Burst 50		●		●		●	●	●
Tri-Level 1080i59.94	●		●				●	●
Tri-Level 1080i50		●		●			●	●
Tri-Level 720p59.94	●				●		●	●
Tri-Level 720p50		●				●	●	●
DARS 48 kHz							●	●
Word Clock 48 kHz							●	●

Vertical (lines) – the slider selects the vertical offset between the reference input to the REF-1801 and the output being configured.

- The nominal range is +/- one frame, and is indicated (in lines) at the ends of the slider
- The current value is shown in the data box at the right side of the slider.

The value can be changed by clicking and dragging the slider, or by typing a value directly into the data box.

Horizontal (μsec) – the slider selects the horizontal offset between the reference input to the REF-1801 and the output being configured.

- The nominal range is 0 to 1 line, and is indicated (in μsec) at the ends of the slider
- The current value is shown in the data box at the right side of the slider.

The value can be changed by clicking and dragging the slider, or by typing a value directly into the data box.

2.6.5   SPG Option tab

The SPG option adds sync pulse generation capability to the REF-1801.

- To activate this option, you must obtain a licence key from Miranda Technologies Inc.
- Type the licence key in the *Enter Key* box and then click on *Enable Option* to enable the option's features
- Once the Key has been entered, and the SPG option is activated, the sync pulse generation features of the REF-1801 will be available.
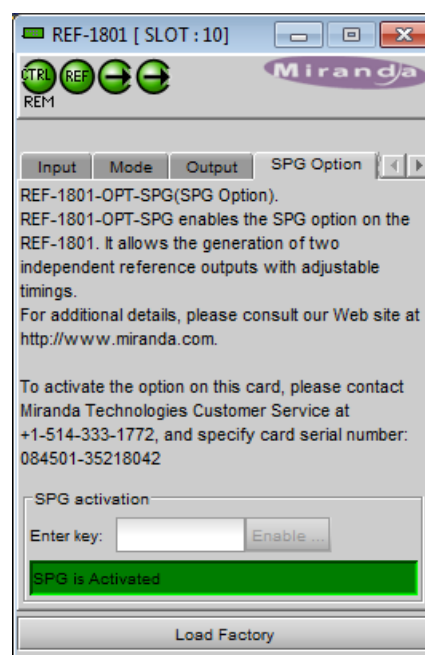

Figure 3.5 *SPG Option tab*

2.6.6 Alarms tab

Timecode logging
Select a checkbox to send the indicated time code to the iControl GSM, where it can be used by other network devices.

- As this uses network resources, it is suggested that these boxes be left unchecked if there is no need to use the time code in this way.

Alarm Configuration
Click the Alarm Config button to open the *Alarm Configuration for REF-1801* panel in a new window. This panel allows the alarm reporting of the REF-1801 to be configured.

The panel is organized in columns.

Status/Name
This contains an expandable tree listing all the alarms reported by this card.
- Each alarm name includes an icon that shows its current status

The **Overall alarm** and **GSM contribution** columns contain pulldown lists that allow the level of contribution of each individual alarm to the alarm named in the column heading to be set.

- *Overall Alarm*
  This column allows configuration of the contribution of each individual alarm to the Overall Alarm associated with this card. The Overall Alarm is shown in the upper left corner of the iControl panel, and also appears at the bottom of the Status/Name column.

Figure 3.6   Alarms tab

- *GSM Contribution*
  This column allows configuration of the contribution of each individual alarm to the GSM Alarm Status associated with this card. GSM is a dynamic register of all iControl system alarms, and is also an alarm provider for external applications. The possible values for this contribution are related to the Overall alarm contribution:

  - If the Overall alarm contribution is selected as Disabled, the GSM alarm contribution can be set to any available value

  - If the Overall alarm contribution is selected as any level other than disabled, the GSM contribution is forced to follow the Overall Alarm.
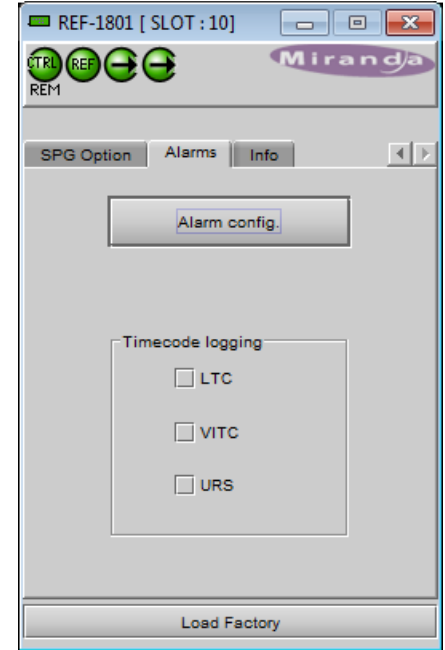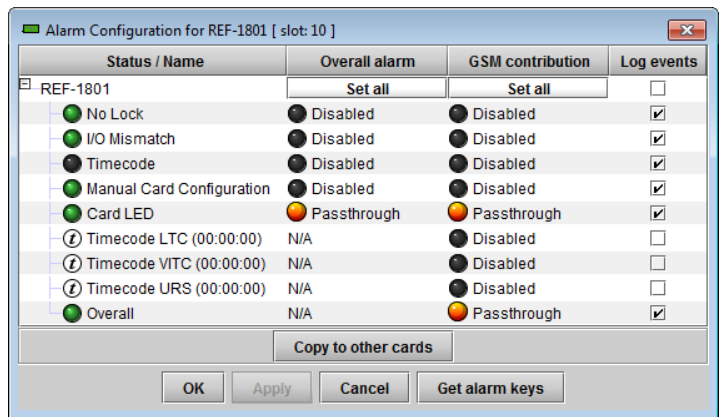

Figure 3.7   Alarm Configuration panel

Levels associated with these alarms:

The pulldown lists may contain some or all of the following options:

⚫ Disabled	The alarm makes no contribution (black icon)
🟡 Minor	The alarm is of minor importance (yellow icon)
🟠 Major	The alarm is of major importance (orange icon)
🔴 Critical	The alarm is of critical importance (red icon)
🟠 Passthrough	The alarm exists but has no effect (used for text and composite alarms)

Shortcut: *if you click in one of the Set All boxes at the top of a column, you will open a pulldown that lets you assign a level to all alarms in that column simultaneously.*

Once the alarms are configured, you may accept the changes or discard them:

Log Events
iControl maintains a log of alarm events associated with the card. The log is useful for troubleshooting and identifying event sequences. Click in the checkbox to enable logging of alarm events for each individual alarm.
At the bottom of the window are several other controls:

Copy to other cards
Click this button to open a panel that allows the alarm configuration set for this card to be copied into another REF-1801 card.

- Select one or more destination cards from the list in the window by clicking in the checkboxes, or all of them by clicking in the *All* checkbox
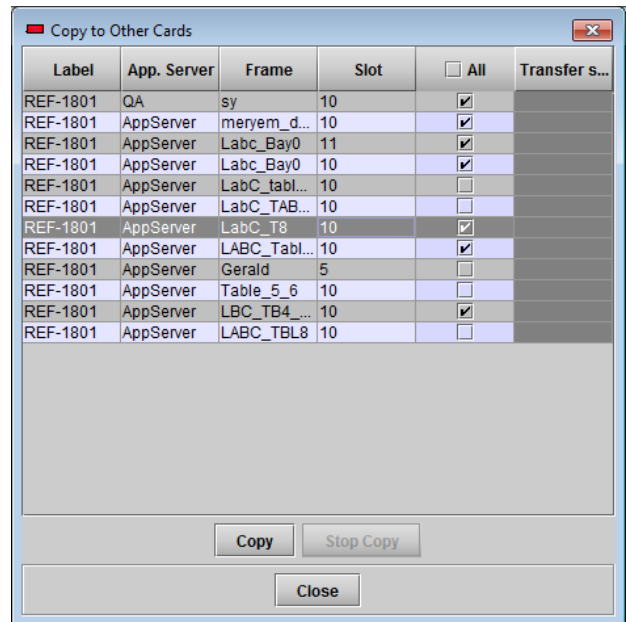

Figure 3.8 Copy to other cards window

Get alarm keys

Click this button to open a save dialog where you can save a file containing a list of all alarms on this card and their current values, along with an Alarm Key for each. The alarm keys are useful for system integration and troubleshooting.
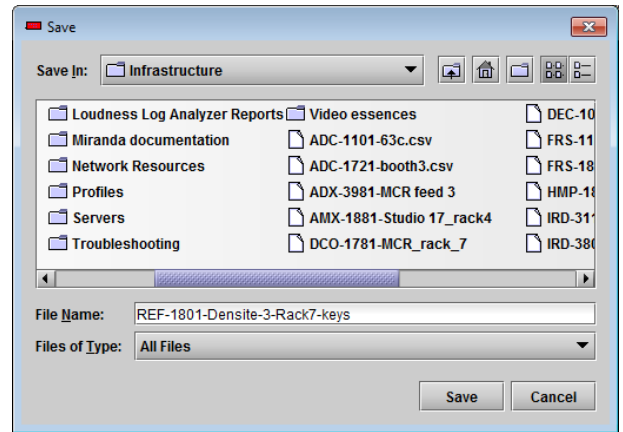
- The file is saved in Excel.csv format

Figure 3.9 *Get alarm keys save dialogue*

OK, Apply, Cancel

- ***OK*** accepts the settings and closes the window once the card confirms that there are no errors.
- ***Apply*** accepts the settings, but leaves the window open
- ***Cancel*** closes the window without applying any changes, and leaves the previous settings intact.

2.6.7   Info tab

When the REF-1801 is included in an iControl environment, certain information about the card should be available to the iControl system. The user can enter labels and comments that will make this card easy to identify in a complex setup. This information is entered into data boxes in the Info control panel.

Label: type the label that appear for this card when it appears in iControl applications

Short Label   type the short-form label that iControl uses in some cases (8 characters)

Source ID   type a descriptive name for this card

Comments: type any desired text

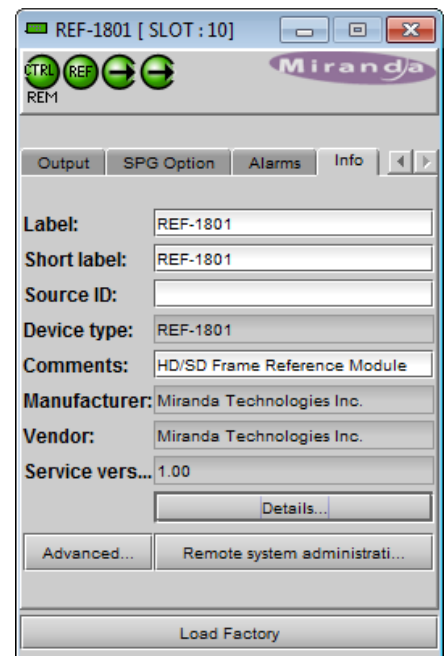The remaining data boxes show manufacturing information about this card.

Figure 3.10   *Info tab*

Three buttons in the panel give access to other information.

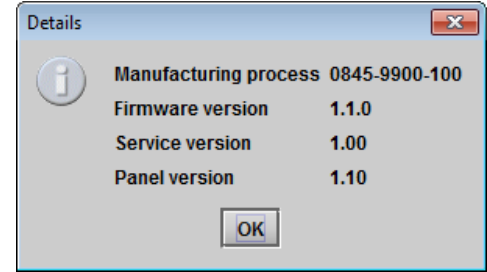- Details…: Reports the Firmware version, service version, and panel version for this card

Figure 3.11   Details window

- Advanced…: Shows the Miranda LongID for this card. The Miranda LongID is the address of this REF-1801 in the iControl network.
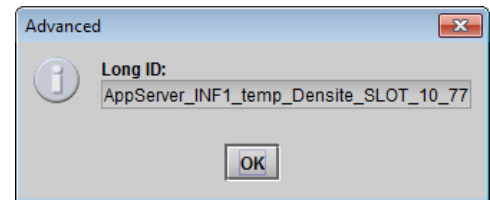

Figure 3.12   Advanced window

- Remote System Administration – opens the Joining Locators window, which lists remote lookup services to which this REF-1801 is registered.

  Add: Force the iControl service for this REF-1801 to register itself on a user-specified Jini lookup service, using the following syntax for the locator's URL in the Input data box:

     jini://<ip_address>

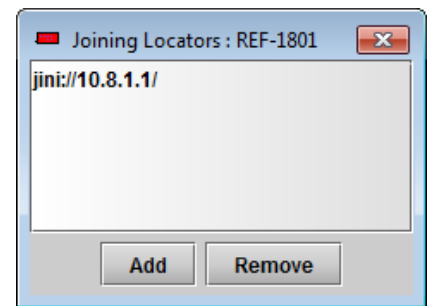 where <ïp_address> is the ip address of the server running the lookup service, e.g.:
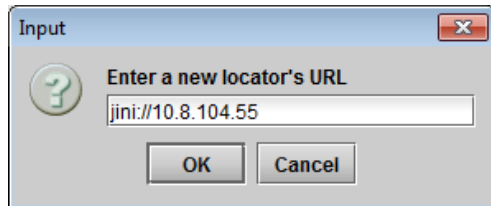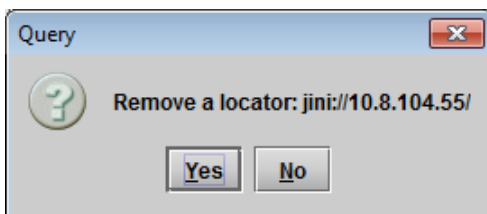

Figure 3.13 Joining Locators window

  Remove: select one of the services listed in the window by clicking on it, and click *Remove* to open a query box allowing you to delete it from the window.

3   Specifications

GENLOCK INPUT

CONNECTOR	BNC per IEC 60169-8 Amendment 2
LOAD	Passive Loop-Through
IMPEDANCE	75 Ohm bridging
RETURN LOSS	> 30dB up to 30MHz
FREQUENCY LOCK RANGE	compliant with RS-170M
SNR	> 40dB

SIGNAL TYPE	Composite NTSC-M, PAL-B Black Burst with optional VITC
STANDARD	SMPTE-170M, ITU-R BT.1700-1, SMPTE-318M
SIGNAL LEVEL	1V p-p

SIGNAL TYPE	HD Tri-Level Sync
STANDARD	SMPTE-274M, SMPTE-296M
SIGNAL LEVEL	600mV p-p

SIGNAL TYPE	DARS AES-3id
STANDARD	SMPTE-276M
SIGNAL LEVEL	1V p-p

SIGNAL TYPE	Word Clock
STANDARD	AES11-2003
SIGNAL LEVEL	2.0V p-p

ANALOG REFERENCE OUTPUT

SIGNAL TYPE	Composite NTSC-M, PAL-B with optional VITC
STANDARD	SMPTE-170M, ITU-R BT.1700-1, SMPTE-318M
SIGNAL LEVEL	1V p-p
RETURN LOSS	> 35dB up to 10MHz

SIGNAL TYPE	HD Tri-Level Sync
STANDARD	SMPTE-274M, SMPTE-296M
SIGNAL LEVEL	600mV p-p

SIGNAL TYPE	DARS AES-3id

STANDARD	SMPTE-276M
SIGNAL LEVEL	1V p-p

SIGNAL TYPE	Word Clock
STANDARD	AES11-2003
SIGNAL LEVEL	2.0V p-p

OTHER

MAXIMUM POWER	5W
PHYSICAL FORMAT	Densité-2