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DENSITÉ series

GPI-1501
General Purpose Interface I/O Module
Guide to Installation and Operation

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Safety Compliance Information

Safety Compliance

This equipment complies with:

- CSA C22.2 No. 60950-1-03 / Safety of Information Technology Equipment, Including Electrical Business Equipment.
- UL 60950-1 (1st Edition) / Safety of Information Technology Equipment, Including Electrical Business Equipment.
- IEC 60950-1 (1st Edition) / Safety of Information Technology Equipment, Including Electrical Business Equipment.

CAUTION

These servicing instructions are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel. Servicing should be done in a static-free environment.

Electromagnetic Compatibility

- This equipment has been tested for verification of compliance with FCC Part 15, Subpart B, class A requirements for Digital Devices.
- This equipment complies with the requirements of:
  EN 55022 Class A, Electromagnetic Emissions,
  EN 61000-3-2 & -3-3, Disturbance in Supply Systems
  EN 61000-4-2, -3, -4, -5, -6, -8 & -11 Electromagnetic Immunity

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GPI-1501

Table of Contents

# 1 GPI-1501 General Purpose Interface I/O Module

1.1 Introduction

The GPI-1501 is a 2RU Densité card that provides 20 dedicated GPI (General Purpose Interface) inputs plus eight terminals that can be individually configured as either a GPI input or GPI output. When paired with an iControl Application Server, the GPI-1501 provides alarm aggregation from older devices that do not offer ethernet port connectivity. The Application Server can report alarm status information to operators via iControl or SNMP. It can also trigger external events, such as selecting an alternate source. The card can interface with automation systems via its GPI outputs for the control of legacy devices. Each incoming GPI is time-stamped, either with incoming timecode or using the card's internal clock, for accurate logging and report generation. The GPI-1501 is also very useful in unmanned locations for reporting environmental anomalies (intrusion, high humidity, temperature, smoke, etc.) when connected to GPI-equipped sensors. Multiple GPI-1501 cards can be ganged together to meet the requirements of larger installations.

1.2 Features

- Provides GPI alarm aggregation for older devices, bridging the gap to modern IP-enabled control systems
- Interfaces seamlessly with most automation systems
- Alarm aggregation and control of virtually any GPI-enabled device
- Scalable to address large systems
- Time-stamped events for accurate logging and root cause analysis
- 20 dedicated GPI inputs and 8 individually-configurable as GPI In/Out per card
- SMPTE-12M LTC timecode input
- SNMP support (status reporting) through an iControl Application Server
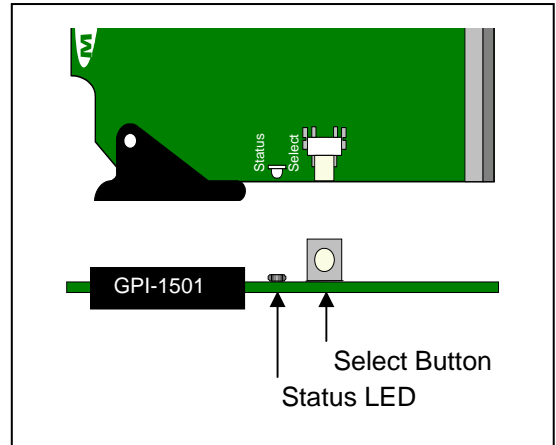- Accurate internal clock with NTP protocol support

1.3 Block Diagram
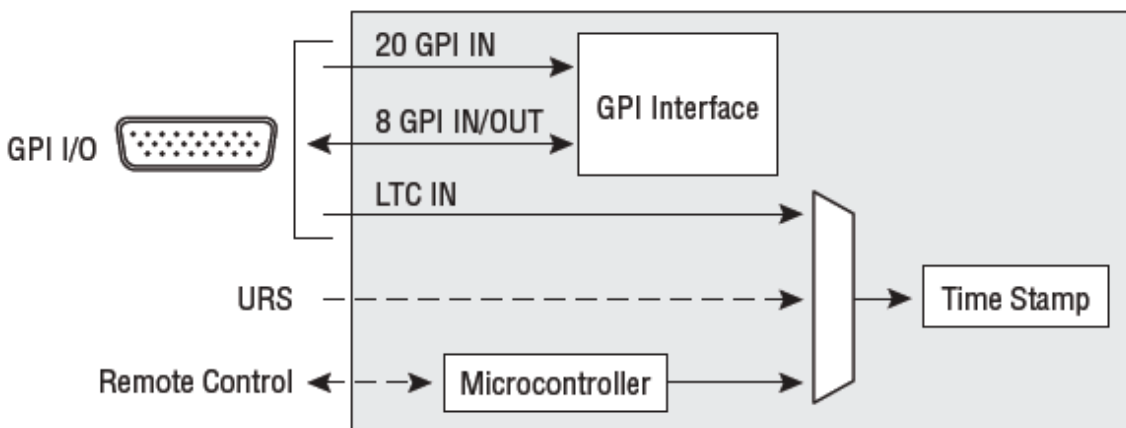
1.4 Front Card-edge Interface

The front card-edge of the GPI-1501 incorporates two elements:

- Status LED (see section 3.2)
- Select Button (see section 3.3)

Select Button
Status LED

2   Installation

2.1   Unpacking

Make sure the following items have been shipped with your GPI-1501. If any of the following items are missing, contact your distributor or Miranda Technologies Inc.

- GPI-1501 GPI I/O Module
- GPI-1501-SRP Rear Panel (see figure 2.1)
- GPI-1501-TBA 44-pin terminal block adapter (optional)

2.2   Installation in the Densité frame

The GPI-1501 and its associated rear connector rear panel must be mounted in a DENSITÉ frame. It is not necessary to switch off the frame's power when installing or removing the card.

- Install the rear panel with the card out of the frame, then insert the card

See the DENSITÉ Frame manual for detailed instructions for installing cards and their associated rear panels.

2.3   Rear Panel Connections

The rear panel holds a single DB-44 connector, through which all signal inputs and outputs are routed.

The pinout of this connector is as follows:

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GPIO-1 +	12	GPI-I 7	23	RS422-TX +	34	GPIO-5 −
2	GPIO-3 −	13	GPI-I 4	24	GPI-I 19	35	GND
3	GPIO-4 +	14	GPI-I 1	25	GPI-I 17	36	GPIO-7 +
4	GPIO-6 −	15	GND	26	GPI-I 13	37	RS422-RX −
5	GPIO-7 −	16	GPIO-1 −	27	GPI-I 11	38	GPI-I 20 / LTC
6	GPIO-8 +	17	GPIO-2 +	28	GPI-I 8	39	GPI-I 16
7	RS422-TX −	18	GPIO-4 −	29	GPI-I 5	40	GPI-I 14
8	GPI-I 18	19	GPIO-5 +	30	GPI-I 2	41	GND
9	GPI-I 15	20	GPIO-6 +	31	GND	42	GPI-I 9
10	GPI-I 12	21	GPIO-8 −	32	GPIO-2 −	43	GPI-I 6
11	GPI-I 10	22	RS422-RX +	33	GPIO-3 +	44	GPI-I 3
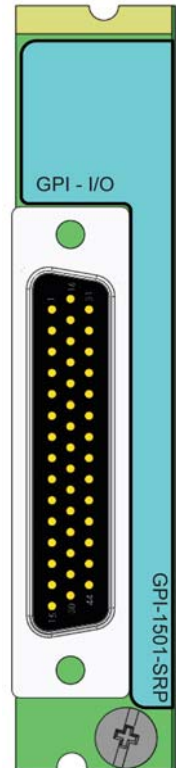
For ease of connection, the GPI-1501-TBA terminal block adapter with integral 44-pin connector can be used.

- Wire all the GPI inputs and outputs onto the adapter
- LTC time code can be connected to GPI IN 20 if desired
- RS 422 connections are provided
- Plug the adapter directly into the connector on the GPI-1501 rear panel.

GPI-1501-TBA DB-44P

GND	GND
GPI-I 1	GPI-I/O 1-
GPI-I 2	GPI-I/O 1+
GPI-I 3	GPI-I/O 2-
GPI-I 4	GPI-I/O 2+
GPI-I 5	GPI-I/O 3-
GPI-I 6	GPI-I/O 3+
GPI-I 7	GPI-I/O 4-
GPI-I 8	GPI-I/O 4+
GPI-I 9	GPI-I/O 5-
GPI-I 10	GPI-I/O 5+
GPI-I 11	GPI-I/O 6-
GND	GND
GPI-I 12	GPI-I/O 6+
GPI-I 13	GPI-I/O 7-
GPI-I 14	GPI-I/O 7+
GPI-I 15	GPI-I/O 8-
GPI-I 16	GPI-I/O 8+
GPI-I 17	422-RX -
GPI-I 18	422-RX +
GPI-I 19	422-TX -
GPI-I 20/LTC	422-TX +
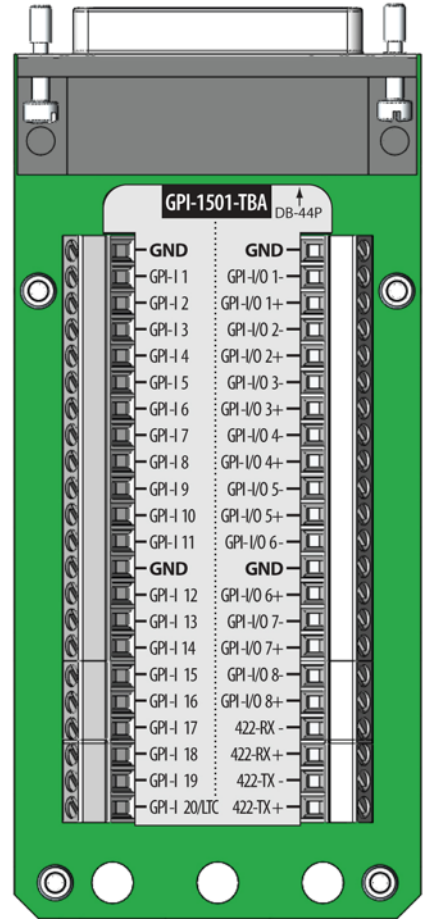
3   Operation

3.1   Control options

The GPI-1501 can be controlled in two different ways:

- The local control panel and its push-buttons can be used to move through a menu of parameters and to adjust parameter values (see section 3.3)

- Miranda's iControl system can be used to access the card's operating parameters from a remote computer, using a convenient graphical user interface (GUI). (see section 3.4)

3.2   Card-Edge Status LED

The status monitor LED is located on the front card-edge of the GPI-1501, and is visible through the front access door of the DENSITÉ frame. This multi-color LED indicates the status of the GPI-1501 by color, and by flashing/steady illumination.

The chart shows how the various error conditions that can be flagged on the GPI-1501 affect the LED status.
- If a cell is gray, the error condition cannot cause the LED to assume that status
- If more than one LED status is possible for a particular error condition, the status is configurable. See Section 3.4.6 for details.
- The factory default status is shown by a ✪

The LED will always show the most severe detected error status that it is configured to display, and in the chart error severity increases from left to right, with green representing no error/disabled, and flashing red the most severe error.

	LED Status			
Error Condition	Green	Yellow	Red	Flashing Red
No errors	✪			
Hardware failure				✪
No rear				✪

If the LED is Flashing Yellow, it means that the card is selected for local control using the Densité frame's control panel. See Section 3.3 for details.

3.3   Local control using the Densité frame control panel

3.3.1   Overview

Push the SELECT button on the GPI-1501 card edge (see Section 1.4) to assign the local control panel to operate the GPI-1501. 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 by a hinged connector, and when installed is located in the front center of the frame, positioned in front of the power supplies. The panel consists of a display unit capable of displaying two lines of text, each 16 characters in length, and five pushbuttons.

The panel is assigned to operate any card in the frame by pushing the SELECT button on the front edge of that card.

- Pushing the CONTROLLER button on the control panel selects the Controller card itself.
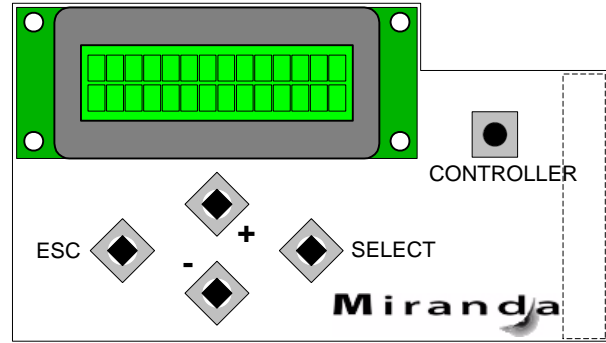- The STATUS LED on the selected card flashes yellow.

Figure 3.1 *Densité Frame local control panel*

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

[+] [–]   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.

3.3.2   Menu for local control

The GPI-1501 has operating parameters which may be adjusted locally at the controller card interface.

- Press the SELECT button on the GPI-1501 front card edge to assign the Densité frame's local control panel to the GPI-1501
- Use the keys on the local control panel to step through the displayed menu to configure and adjust the GPI-1501

The complete menu structure is shown in the Annex to this document, beginning on page 16.

3.4   Remote control using iControl

The operation of the GPI-1501 may be controlled using Miranda's iControl system.

- This manual describes the control panels associated with the GPI-1501 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 GPI-1501 icon to open the control panel.

3.4.1 The iControl graphic interface window

The basic window structure for the GPI-1501 is shown in figure 3.2. The window identification line gives the card type (*GPI-1501*) and the slot number where the card installed in its Densité frame.
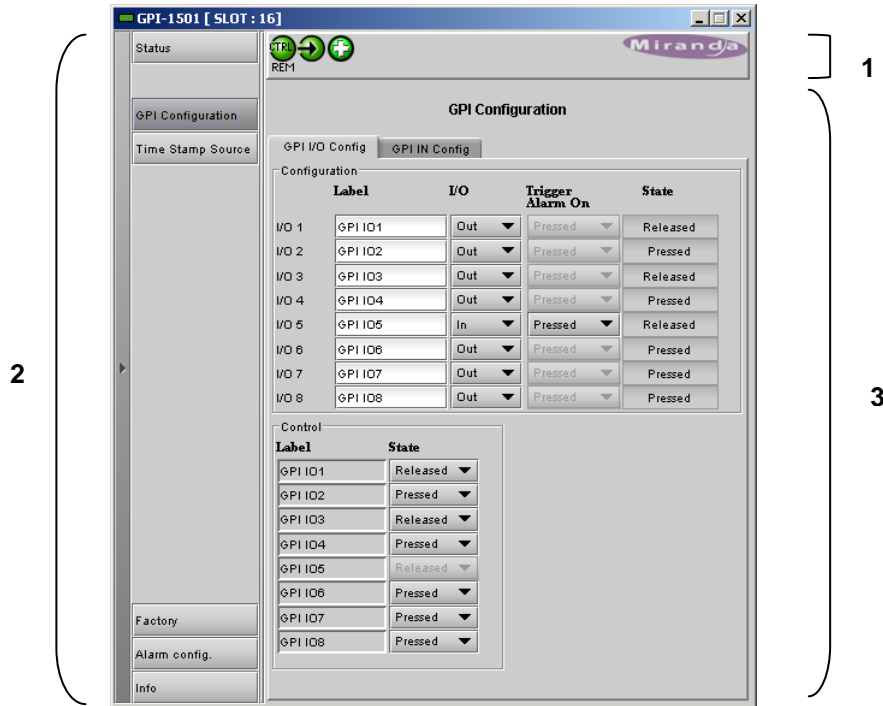

Figure 3.2 *GPI-1501 iControl graphic interface window*

There are three main sections in the window itself, identified in figure 3.2:

1. The Status Icon area shows a series of six icons that report the status of some card parameters. Figure 3.3 shows the various forms that may appear; their meaning is described below.

    Icon 1 – Control status
    - A: Green - Remote Control via iControl
    - B: Yellow - Local control using the menu

    Icon 2 – Rear status
    - A: Green – Rear panel is present
    - B: Red - Rear panel is missing

    Icon 3 – Card Heath status
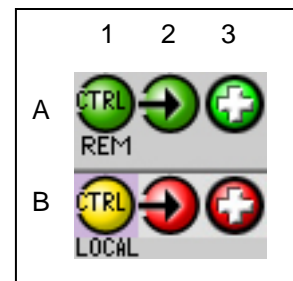   - A: Green – OK
    - B: Red – Hardware failure

Figure 3.3 *Status icons*

When an icon shows an error state, a message describing the error in more detail will appear beneath the icons. If there is more than one error, they will cycle through the display.

In all cases, mousing over an icon will cause a more detailed description of its current status to appear in the message area. Error message cycling will resume when the cursor is no longer over an icon.

Move the mouse over an icon and a status message appears below the icon providing additional information. If there is an error, the error status message appears in the message area without mouse-over.

- If there are multiple errors, the error messages cycle so all can be seen
- The icon whose status or error message is shown is highlighted with a mauve background

2. The left-hand side of the panel contains a series of buttons that control the contents of the main window (section 3). Click on one to access the indicated controls. The selected button is highlighted (darker) and the main panel heading matched the button name.

3. This section contains the main operating controls and displays for managing the GPI-1501's feature set. The contents are selected by clicking a button on the left-hand side of the screen.

The left side of the window (i.e. section 2) can be hidden or revealed by clicking the arrow icon at the center of the left side border.

Each of the panels associated with the groups accessed from the buttons in Section 2, and shown in Section 3, is described individually in the following sections.

3.4.2 The *Status* panel

This panel shows the status of the two available time code inputs to this card.

- Green icon – signal available
- Red icon – signal not available

URS TC – time code transferred to the card through the Universal Reference Signal that is available to all cards in this Densité frame.

- The URS is generated by a reference module (REF-XXXX) which must be installed in the frame for the URS TC to be available. See the Miranda website for information about currently-available REF-series cards.

LTC – longitudinal time code per SMPTE 12M may be connected to the GPI-1501 on GPI 20 through the rear panel connector.
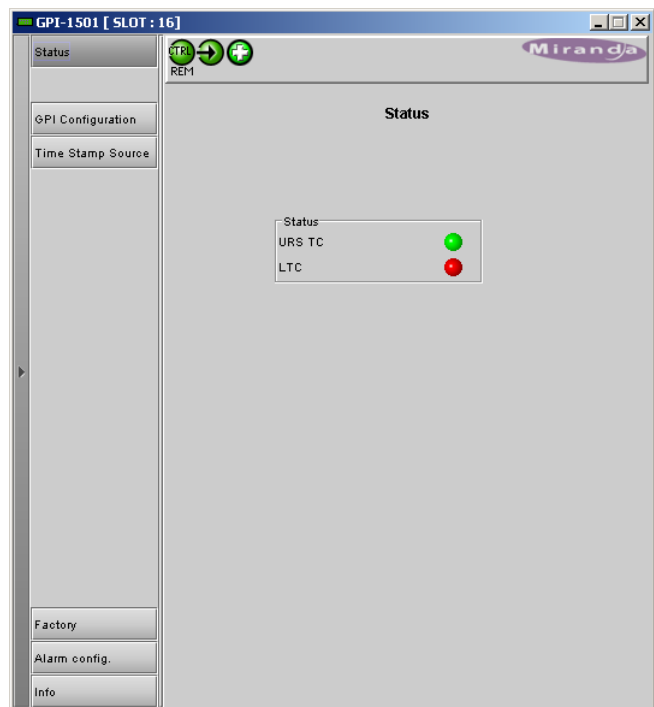

Figure 3.4 *Status panel*

3.4.3 The *GPI Configuration* panel

GPI I/O Config **tab**

Use these controls to configure the eight GPIs that
can be set as inputs or outputs.

> *GPIs set to OUT can be configured to respond*
> *to alarms generated on another card in the*
> *iControl network – see Annex 2 beginning on*
> *page 18.*

I/O pulldown – select the operating mode for this
GPI:
- Out
- In

Trigger Alarm On – select the state that will trigger
an alarm on this GPI input (disabled for GPIs whose
mode is selected as OUT)

- Pressed
- Released

State – shows the current state of the GPI
- Pressed
- Released

Figure 3.5 *GPI Configuration – GPI I/O Config tab*

Control Section:

The pulldowns allow manual control of the state (*Pressed* or *Released*) of those GPIs configured as OUT.
This is useful for testing purposes.

GPI IN Config **tab**

Use these controls to configure the twenty GPI
inputs.

Label – type in the data box to change the GPI label
from the default, which is GPI INx where x = the GPI
number.

Alarm pulldown
- Pressed
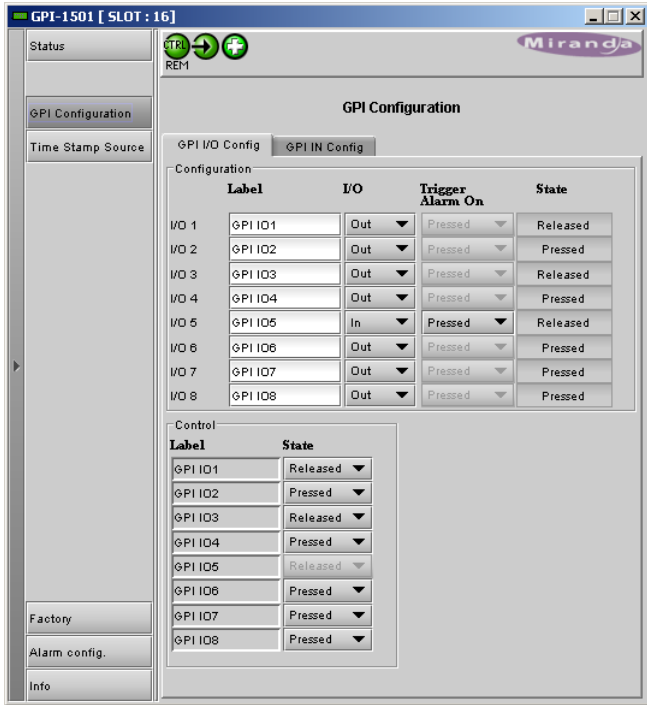- Released

State
- Pressed
- Released

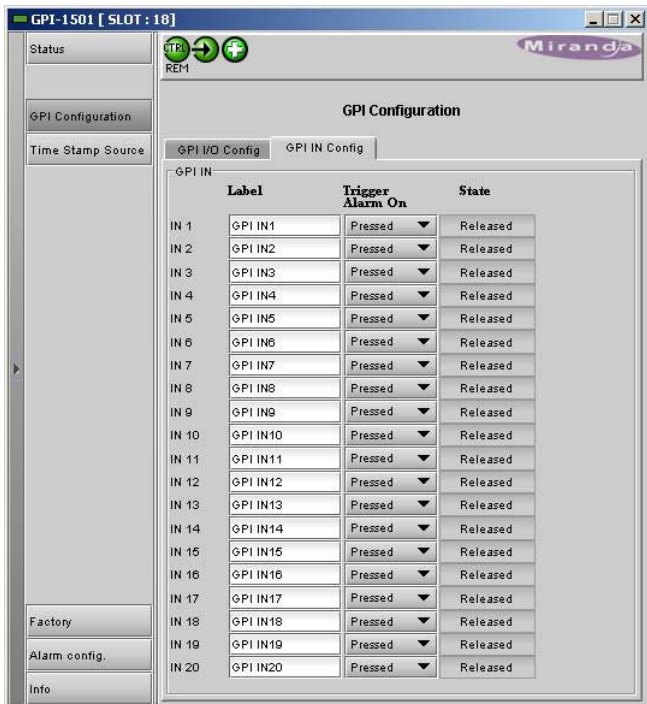**Figure 3.6** *GPI Configuration – GPI IN config tab*

3.4.4   The *Time Stamp Source* panel

GPI events in the GPI-1501 may be time-stamped. Use this panel to select the source of time information for the time stamp process.

Time stamp source:

- *Disabled* – no time stamping
- *RTC* – Real time clock from the Densité frame's controller card, if supported by the installed controller.
- *LTC* **Input** – use the LTC input arriving on the rear-panel GPI-20 input (if connected)
- *URS* – use the time information carried in the URS signal internal to the Densité frame. The URS is generated by a reference module (REF-XXXX) which must be installed in the frame for the URS to be available. See the Miranda website for information about currently-available REF-series cards.

SMPTE309:

Use the time code format as defined in SMPTE 309M:

- OFF
- ON

Figure 3.7 *Time Stamp Source panel*

SMPTE309 is the standard specifying the transmission of years and date information inside LTC binary groups. Without SMPTE309, only hours, minutes, seconds and frames are available from LTC

When the source is RTC, frames are not reported.

3.4.5   The *Factory* panel

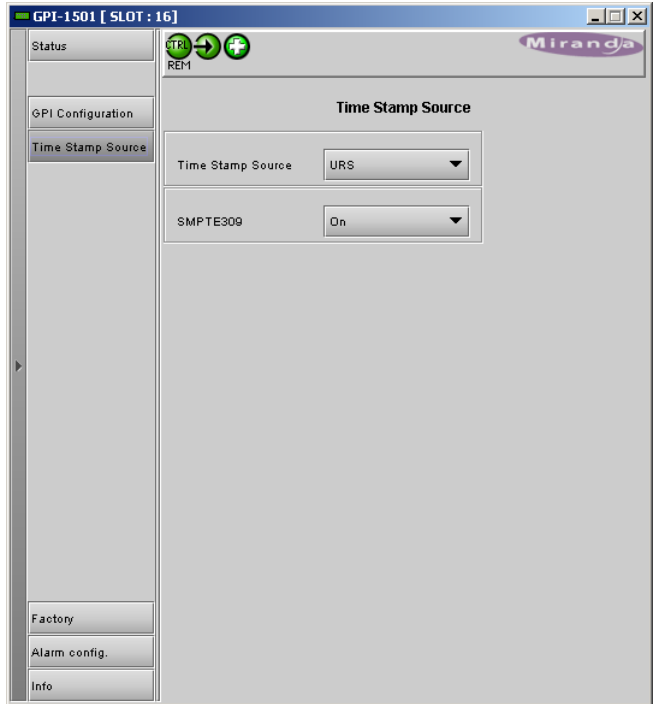Click the *Load Factory* button to reset all parameters on this GPI-1501 card to factory-defined default values.
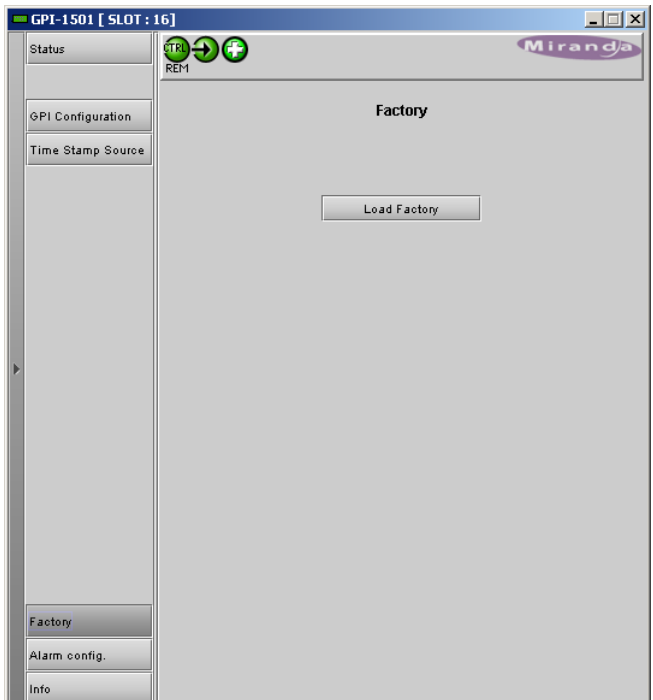

Figure 3.8 *Factory panel*

3.4.6   The *Alarm Config* panel

This panel allows the alarm reporting of the GPI-1501 to be configured. The panel opens in a new window when the button is clicked, and can be resized if needed.

The panel is organized in columns.

Status/Name
This contains an expandable tree listing all the alarms reported by this GPI-1501 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.

- If there is no arrowhead in the box, there is no pulldown and the alarm is not user-configurable

- #### *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.

- #### *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.
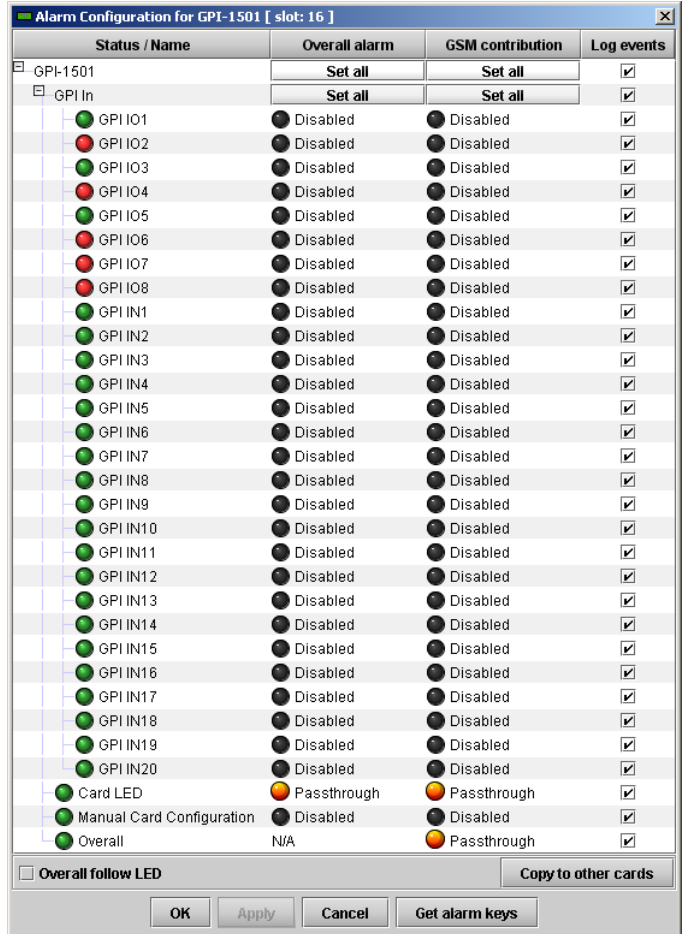

Figure 3.9 *Alarm Config panel*

> **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 on "Set All" beside a major heading in the Status/Name column, you will open a pulldown that lets you assign a level to all alarms in that section of the column simultaneously.*

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 GPI-1501 card.

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

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.

3.4.7   The *Info* panel

When the GPI-1501 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 via the Info control panel. This panel also shows other information about the card.

Label: type the label that appear for this GPI-1501 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 GPI-1501

Comments: type any desired text

Figure 3.10 *Info panel*

The remaining data boxes show manufacturing information about this card.

- Details…: Reports the Firmware version, service version, and panel version for this card
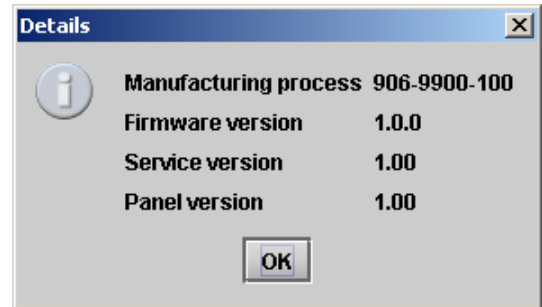
Figure 3.11 *Details window*

\

- Advanced…: Shows the Miranda LongID for this card. The Miranda LongID is the address of this GPI-1501 in the iControl network.
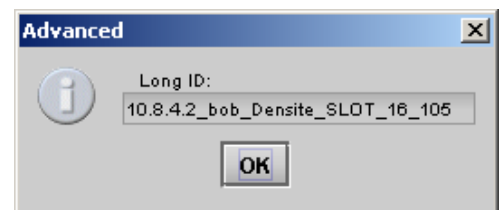
Figure 3.12 *Advanced window*

- Remote System Administration – opens the Joining Locators data box, which lists remote lookup services to which this GPI-1501 is registered.

    Add: Force the iControl service for this GPI-1501 to register itself on a user-specified Jini lookup service, using the following syntax in the *Input* data box:

      jini://<ip_address>

    where <ip_address> is the ip address of the server running the lookup service, e.g.:
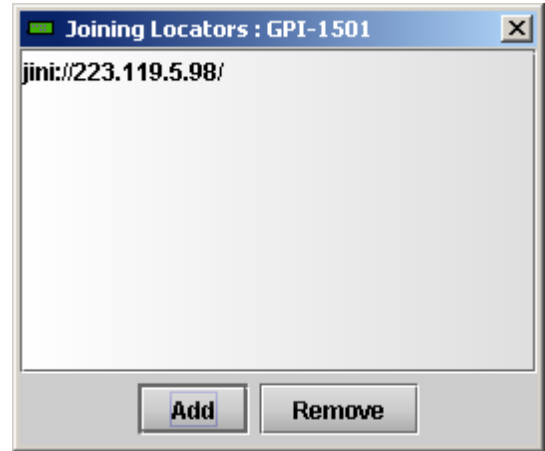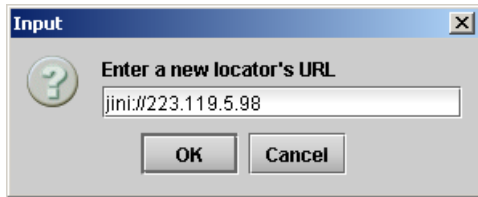
Figure 3.13 *Joining Locators window*

Remove: select one of the services listed in the window by clicking on it, and click *Remove* to delete it from the window.

4   Specifications

GPI IN

CONNECTOR	DB-44
NUMBER OF INPUT	20
PULL-UP VOLTAGE	2.3 Volts
SOURCE CURRENT	2 mA when input shorted
LOW LEVEL ACTIVATION	0.8 Volts max
OVER VOLTAGE	25 Volts max
PULSE DURATION	8ms min

GPI BI-DIRECTIONAL

CONNECTOR	DB-44
NUMBER OF I/O	8

Input mode:

PULL-UP VOLTAGE	2.3 Volts
SOURCE CURRENT	2 mA when input shorted
LOW LEVEL ACTIVATION	0.8 Volts max
OVER VOLTAGE	25 Volts max
PULSE DURATION	8ms min

Output mode:

CONTACT CLOSURE CURRENT	50 mA max
REVERSE VOLTAGE	-15 Volts max
REVERSE CURRENT	-50 mA max
V OUT LOW	0.6 Volts at 1.5mA

RS422

CONNECTOR	DB-44
SIGNAL TYPE	RS-422, full duplex
PROTOCOL	As per Oxtel automation protocol

TIME CODE

CONNECTOR	Sharing Input 20 of DB-44 GPI connector
SIGNAL TYPE	Unbalanced as per SMPTE-12M / Realtime only SMPTE-309M

OTHER

MAXIMUM POWER	1W
PHYSICAL FORMAT	Densité-2

ANNEX 1 – GPI-1501 Card Menu

TOP LEVEL

```
STATUS ───────── GENERAL STATUS ─────── Hardware diagnostic
                       │                                          │ (Auto Scroll)
                       │                          Rear presence status
                       │
                  GPI STATUS ──────────── I/O X [IN/OUT] = [LOW/HI]
                       │                          … (1..8)              │ (Auto Scroll)
                       │                      IN XX = [LOW/HI]
                       │                          … (1..20)
                       │
                  TIMECODE STATUS ─────── [selected timecode input presence]
                                          (values : LTC, URS, RTC, Detected/Absent)


GPIO CONFIG ─────── GPIO 1 ──────────── DIRECTION ─────── [IN/OUT]
                       │                      │
                       │                    STATE ──────── [LOW/HI]
                       │
                    GPIO 2 ──────────── DIRECTION ─────── [IN/OUT]
                       │                      │
                       │                    STATE ──────── [LOW/HI]
                       │
                    GPIO 3 ──────────── DIRECTION ─────── [IN/OUT]
                       │                      │
                       │                    STATE ──────── [LOW/HI]
                       │
                    GPIO 4 ──────────── DIRECTION ─────── [IN/OUT]
                       │                      │
                       │                    STATE ──────── [LOW/HI]
                       │
                    GPIO 5 ──────────── DIRECTION ─────── [IN/OUT]
                       │                      │
                       │                    STATE ──────── [LOW/HI]
                       │
                    GPIO 6 ──────────── DIRECTION ─────── [IN/OUT]
                       │                      │
                       │                    STATE ──────── [LOW/HI]
                       │
                    GPIO 7 ──────────── DIRECTION ─────── [IN/OUT]
                       │                      │
                       │                    STATE ──────── [LOW/HI]
                       │
                    GPIO 8 ──────────── DIRECTION ─────── [IN/OUT]
                                              │
                                            STATE ──────── [LOW/HI]


TIMESTAMP ─────── TIMESTAMP SOURCE ─────── [NONE / CPUETH2 / LTC / URS]
                       │
                  SMPTE309 SUPPORT ─────── [OFF / ON]


VERSION ───────── CARD REV
                       │
                  CPU BUILD
                       │
                  FPGA BUILD


FACTORY ───────── RESTORE
DEFAULT
```
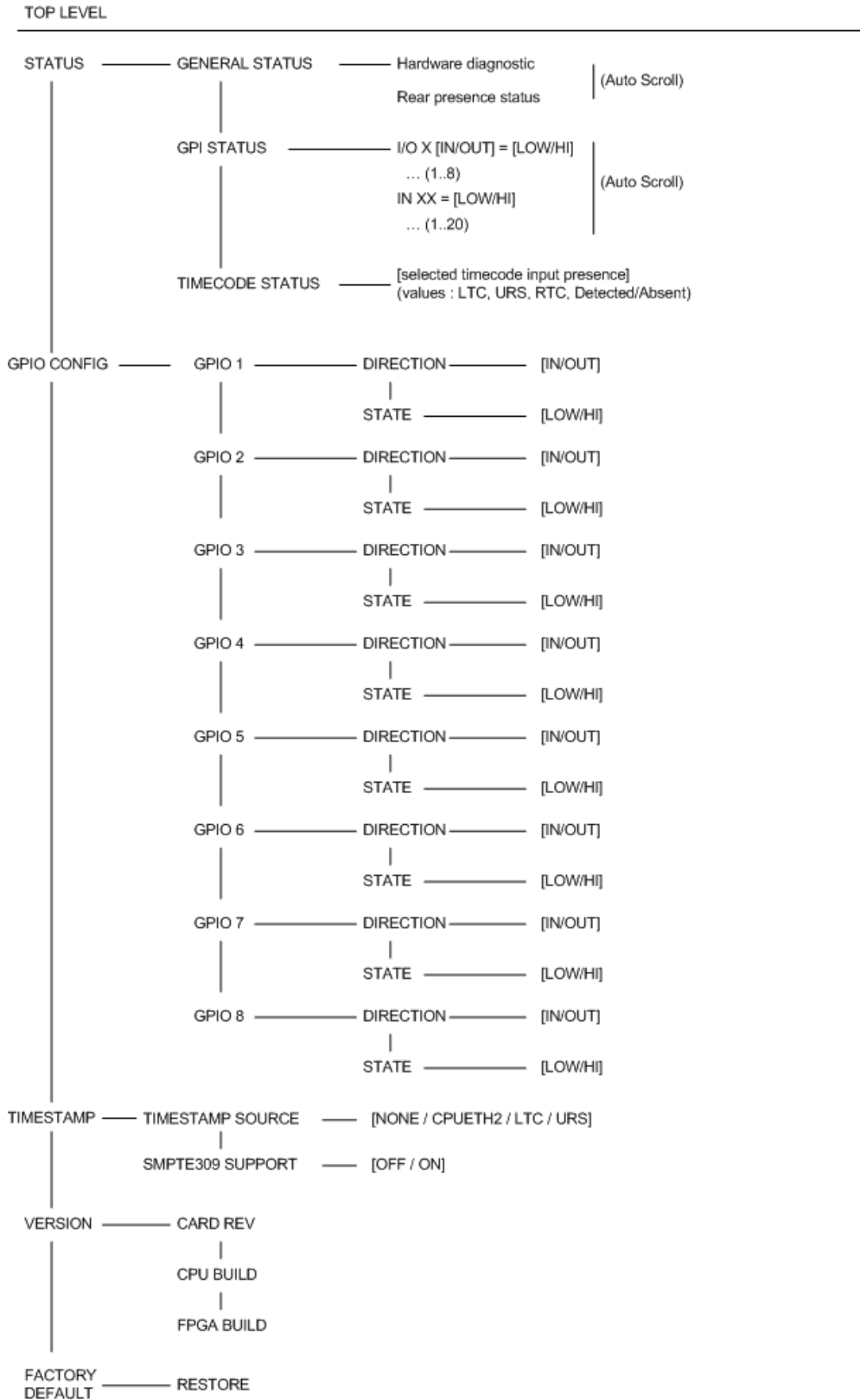
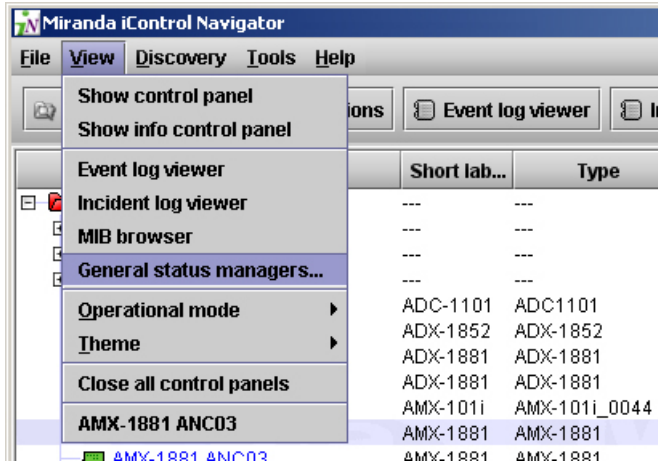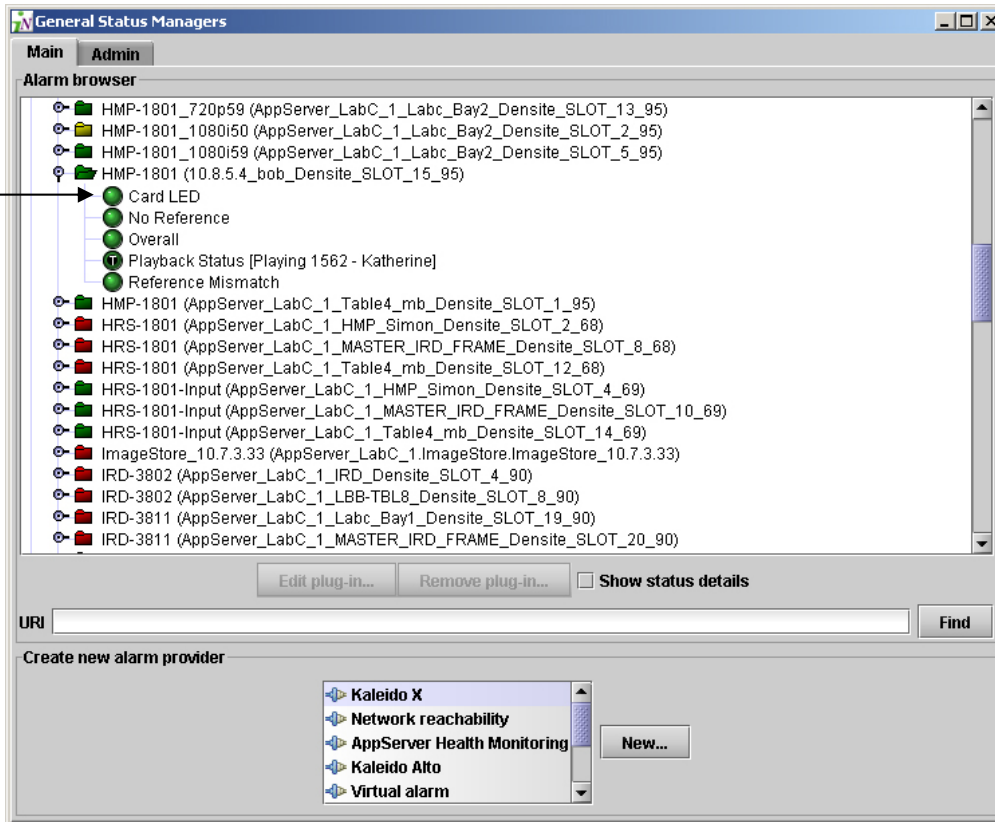## ANNEX 2 – GPI Relay Configurator

This procedure allows the user to configure the GPI outputs on a GPI-1501 to respond to alarms triggered on another card on the iControl network.

From the iControl Navigator main window, click on *General Status Managers…* in the View menu
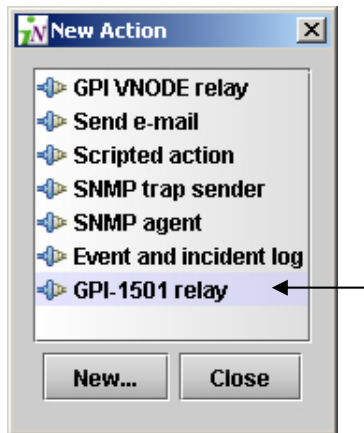

The GSM window will open. In the Alarm Browser section of the Main tab, find the alarm that you would like to trigger a GPI output on a GPI-1501 card. As an example, we have chosen the *Card LED* alarm on an HMP-1801 card. Double-click on the selected alarm
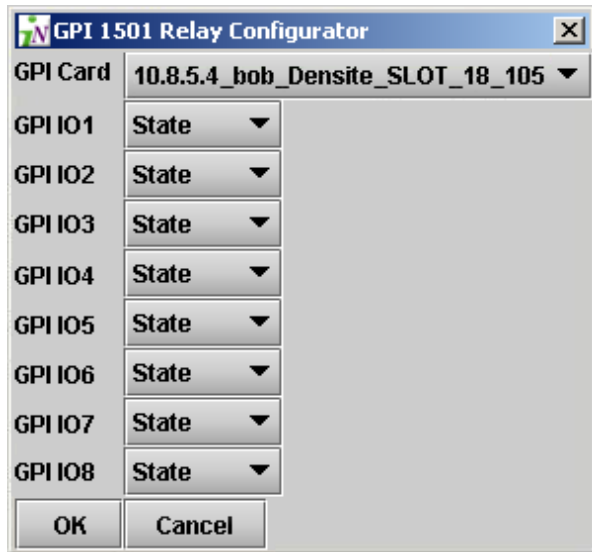
The Alarm Properties window opens:
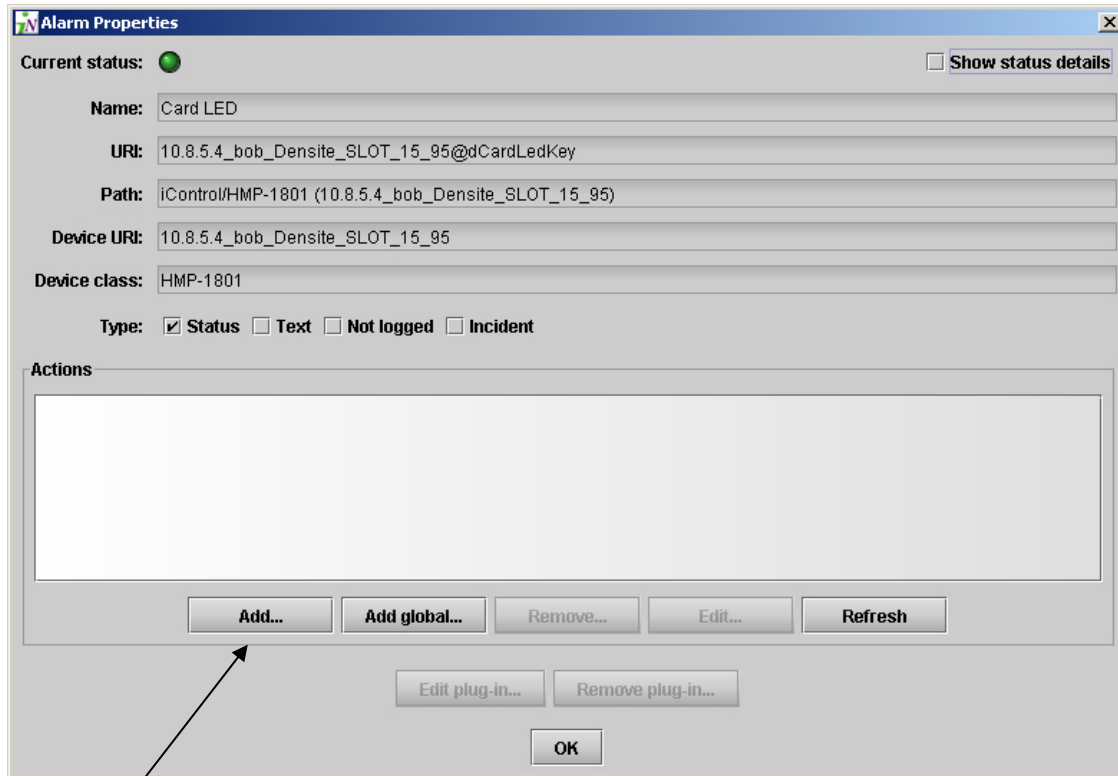
Click *Add…*in the *Actions* section to open the *New Action* window:

Click on *GPI-1501 relay* to select it, and click New…

The GPI-1501 Relay Configurator window opens.

From the *GPI Card* pulldown, select the GPI-1501 card whose GPI outputs you wish to control from this alarm.

- Note that only configurable GPIs that are configured as OUT on the GPI-1501 card itself can be operated in this manner

The eight output relays on the selected card are shown.

- The names of the GPIs are set in the GPI I/O Config panel of the GPI card itself (see page 9).

You may program one or more GPI outputs on this card or on other cards to respond to this alarm.
Each GPI out on this GPI-1501 card can be programmed to respond to a different alarm from a different card

Use the pulldown to select the state that the GPI will assume when it receives a trigger from the designated alarm.

- Pressed = high
- Released = low
- If you leave it at *State*, the GPI is not programmed to respond to this alarm, and can be assigned to a different alarm
- Note – you can use the labels to identify the alarm source once it is set.

Click OK when done, or Cancel to leave the status unchanged.

This new event will appear in the Actions window in the Alarm Properties panel.
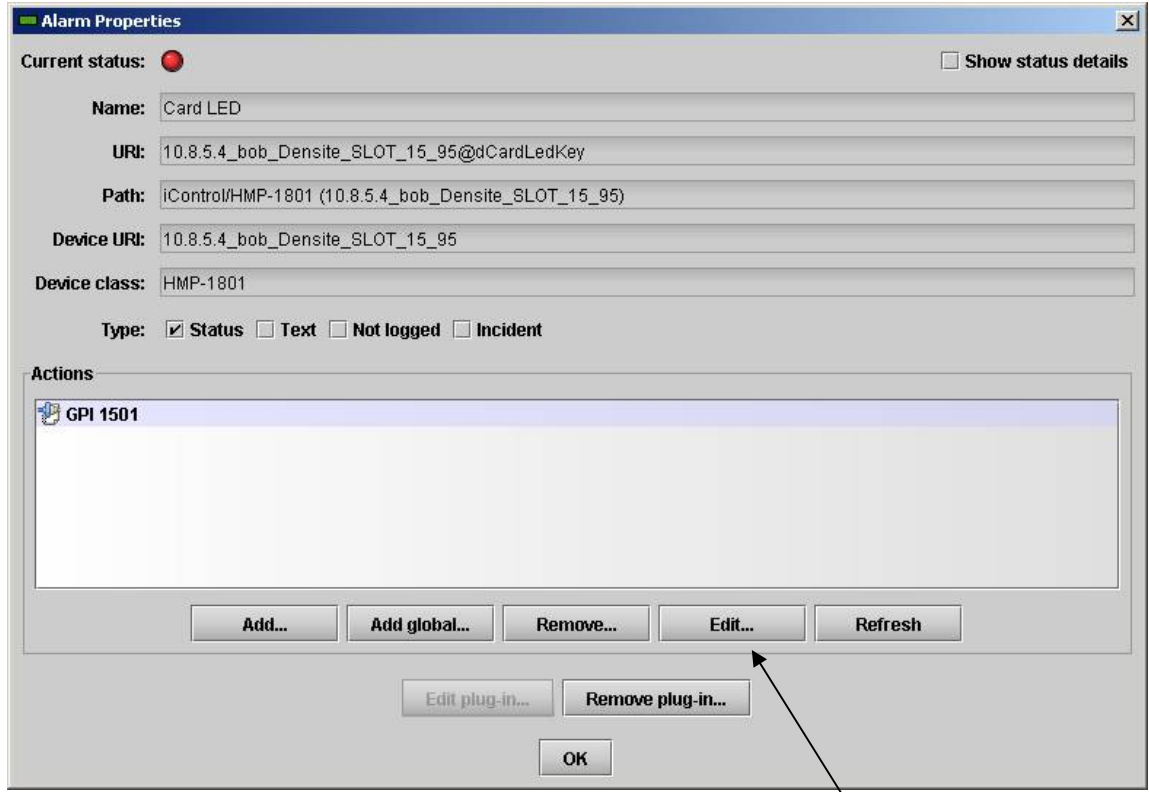
You can edit the event by selecting the GPI-1501 action and clicking the *Edit…* button.

The GPI-1501 Relay Configurator window will open, and you can change the GPI assignments.
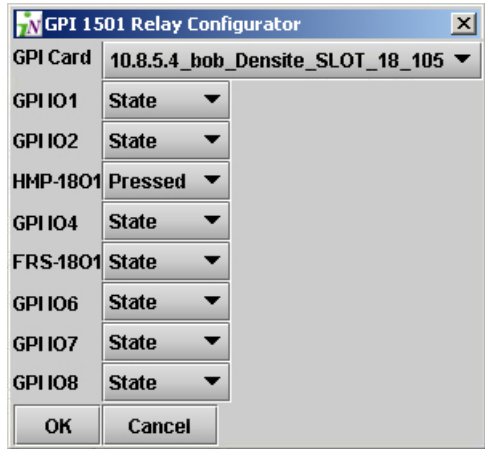
Note that GPI I03 was set for the HMP-1801 card as shown in the example presented here.

GPI-I05 has been set for an alarm originating on an FRS-1801 card, so its pulldown indicates *State* to show that it is not a part of the action we are editing.

You can delete the event by selecting the GPI-1501 action and clicking the *Remove button…* You will be asked to confirm your decision before the item is deleted: