Digital Alert Systems

Application Note

GPIO Expansion Specifications and Configuration
Models EXP-GPIO | EXP-GPIO-A | EXP-GPIO-E

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IMPORTANT NOTE

The EXP-GPIO and EXP GPIO-A boards use the same DB-44 female connector on the DASDEC. ***However, they are not cross-compatible!***

If replacing a DASDEC with the older EXP-GPIO option, DO NOT simply connect the old cable and terminal block to the new unit, as this may cause malfunctions and possibly unwanted service interruptions.

The correct kit is always included with each unit, so installing the kit that comes with the DASDEC is always the best option.

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Internal Expansion GPIO Specifications

Introduction

The **EXP-GPIO | EXP-GPIO-A | EXP-GPIO-E** option provides eight (8) optically isolated inputs and eight (8) relay outputs. The inputs protect the DASDEC and other sensitive equipment from spikes and ground loop currents that can be generated in industrial environments. At the same time, the outputs provide high quality, long life, low current, dry contact switch closures for controlling several external devices.

Depending on the model the output is either a Form C (SPDT) electro-mechanical relay with Normally Open (NO), Normally Closed (NC) and a Common, or Form A (SPST) reed relay normally open, and close when energized.

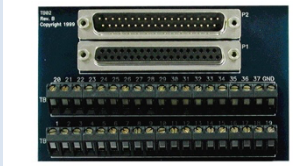
Model	EXP-GPIO			EXP-GPIO-A EXP-GPIO-E
Wiring Kit	KT-108			KT-111
Terminal Block	TB-08			 TB-02
Cable	CA185 (beige) DB44 Male to DB44 Female			CA206 (white or black) DB44 Male to DB37 Male
Type	Form C SPDT Electromechanical			Form A SPST Reed Relay
Input	5 – 30VDC/VAC			3-10VDC/VAC
On Current	3 mA			3 mA
Max Power	1 W			20 mA
Input Z	1 KΩ			560 Ω
Input Wiring				
Inputs	Pins			Pins
0	9,10			2,20
1	11,12			3,21
2	13,14			4,22
3	23,24			5,23
4	25,26			6,24
5	27,28			7,25
6	29,30			8,26
7	40,41			9,27
Output Wiring				
Outputs	NC	Com.	NO	Pins
K1	1	16	31	10,28
K2	2	17	32	11,29
K3	3	18	33	12,30
K4	4	34	35	13,31
K5	5	19	36	14,32
K6	6	20	37	15,33
K7	7	21	38	16,34
K8	8	22	39	17,35
Power				
+ 5 V	N/A			19
+ 12 V	N/A			1
Ground				18,36,37

Table 1. Expansion GPIO Parameters

Input Ports

The input ports are connected to optically isolated input sensors. Each sensor can be used to interface a voltage input and then sense whether the voltage is on or off. Each sensor is isolated (with respect to a common ground) from every other sensor and is also isolated with respect to the host DASDEC ground. This means that signals such as low-level AC line voltage, motor servo voltage, and control relay signals can be 'sensed', or read without the risk of damage due to ground loops or ground faults.

Each sensor input pair has a current limiting resistor that is used to limit the input current to the opto-isolator. The opto-isolator has two 'back-to-back' diodes internally. This allows AC or DC signals to be sensed, regardless of polarity.

The opto-isolator requires approximately 3mA to turn on. The maximum input current is 50mA. There are two things to consider when selecting the input resistor. The first is the turn-on voltage for the circuit to sense, and the second is the maximum input voltage. Maximum input voltage must not provide too much power to the input resistor and must not overdrive the opto-isolator input current specification. The following formulas apply:

Turn on Voltage = diode drop + (turn on current) x (resistance)
[e.g. 1.1 + (.003) x R] Input Current = ((input voltage)-1.1V) / (resistor value)

Maximum voltage = 1.1 + square root of (.25(resistor value))

The following table shows the ranges associated with the resistor:

Input Resistor	Turn-On	Input Range	Max Input	Max Current
1KΩ	3.0V	5.0 – 24.0V	30V	29mA

Note: The turn-off voltage for all resistors is less than 1V.

Important: The input circuits are not intended for monitoring 120-volt AC circuits. In addition to being too high a voltage for the circuits, it is dangerous to have that high a voltage on the card.

Output Ports (Form C Relays)

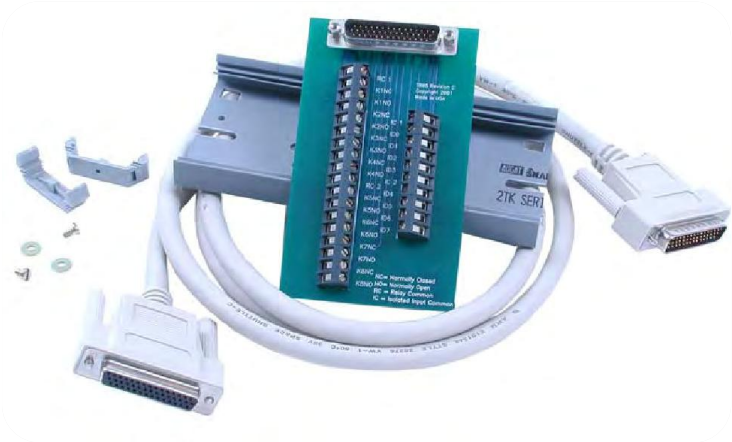
The EXP-GPIO provides eight (8) Form C (SPDT) electromechanical relays. These relays have three connections: Normally Open (NO), Normally Closed (NC), and Common. The relays are all de-energized at power-on.

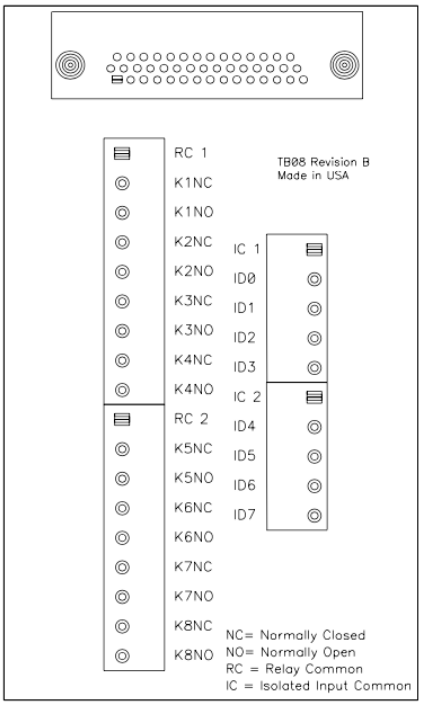
Output Ports (Reed Relay)

Reed relays provide high quality, long life, low current, and dry contact switch closures. Reed relays are not suited for high current applications and can be destroyed by inductive load switching, where a spark occurs across the contacts internally. The relays are normally open, and close when energized.

Terminal Block Kit (Item# KT108) for EXP-GPIO

The Terminal Block Kit (Item# KT108). This kit includes an HD44 Male to HD44 Female six-foot cable (Item# CA185) and a 28-Pin Terminal Block (Item# TB08-KT). A picture and the terminal's silkscreen diagram are shown below.





The CA185 cable is wired straight through, one-to-one.

The terminal block groups the common connections of the PLC-16.PCI into groups of four as shown:

RC1 (Relay Common 1) ties together the ground pins for physical relays K1 – K4, e.g. HD44 pins 16,17,18 and 34 are connected to simplify field wiring

RC2 (Relay Common 2) ties together the ground pins for physical relays K5 – K8, e.g. HD44 pins 19,20,21 and 22 are connected to simplify field wiring

The other eight screw terminals in each group (16 total) are used for wiring to the NO (Normally Open) or NC (Normally Closed) side of the relays. These are labeled K1 – K4 and K5 – K8

IC1 (Input Common 1) ties together one side of the input pins for D0-D3, and IC2 (Input Common 2) ties together one side of inputs D4-D7 to simplify field wiring

The other four pins in each group (8 total) are used for wiring the inputs and are labeled ID0 – ID3 and ID4 – ID8

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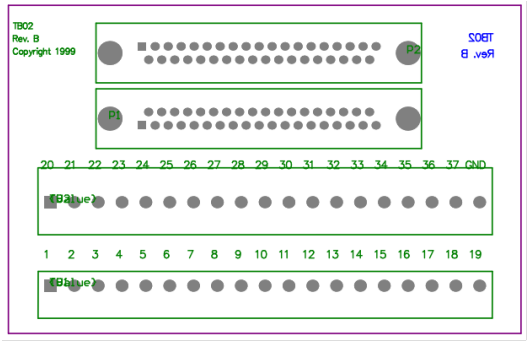
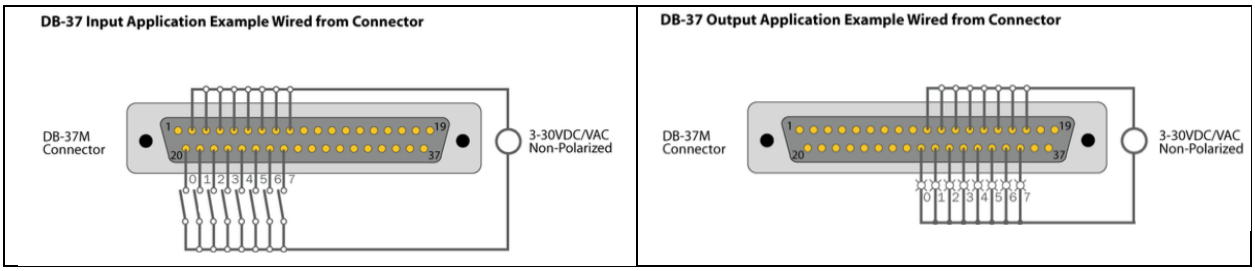
Terminal Block Kit (Item# KT111) for EXP-GPIO-A and EXP-GPIO-E

The KT111 includes the TB02 terminal block, CA206 cable, ST101 Snap Track and STDIN mounting clips. A picture and the terminal's silkscreen diagram are shown below.



The CA206 cable is a DB44 to DB37 conversion cable and is only compatible with the TB02. The TB02 terminal block can be used to break out serial and digital DB37 connectors to screw terminals for easy field wiring. The terminal block was designed with both DB37 male and female connectors; therefore, it can be used with any DB37 board regardless of the board's port gender.



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Expansion GPIO Configuration

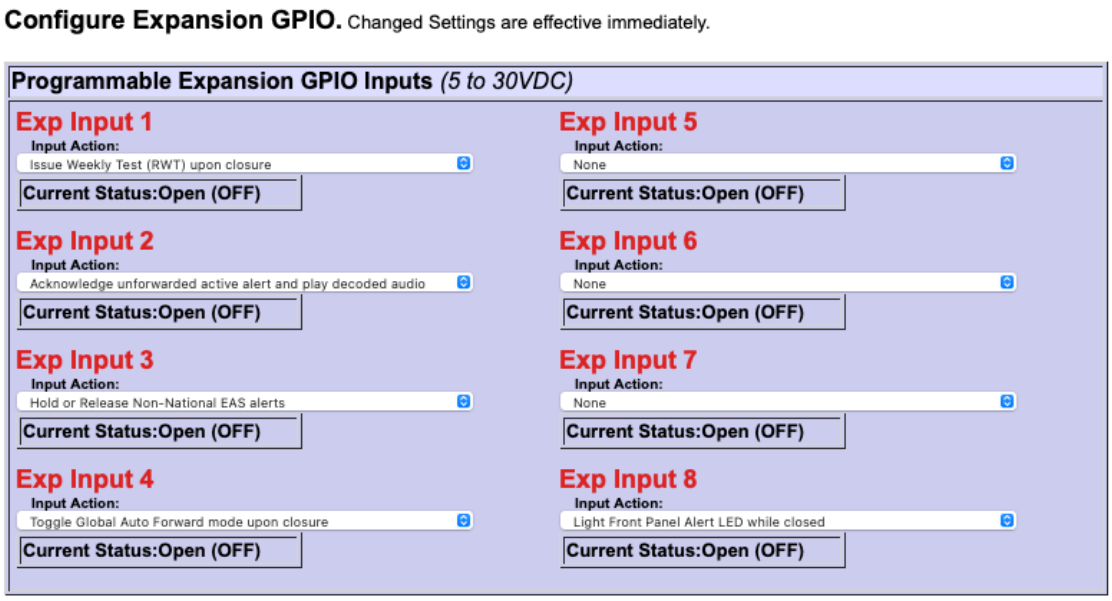
The Expansion GPIO Tab

When the expansion GPIO hardware has been installed and the license key enabled, a new tab becomes available under **Setup > GPIO > Expansion GPIO.** This configuration screen works the same way as other GPIO settings, with the screen divided into two sections: **Programmable Expansion GPIO Inputs** and **ProgrammableExpansion GPIO Outputs**. The available selections for the inputs and outputs are shown in Table 2 below.

GPI (Inputs) Selections	*GPO (Output) Selections*
• None	• Never
• Issue Weekly Test (RWT) upon closure	• During EAS Audio Playout
• Start segmented live EAS on closure; more closures skip to EOM	• Momentarily at start of EAS Audio Playout
• Acknowledge unforwarded active alert and play decoded audio	• Momentarily at end of EAS Audio Playout
• Acknowledge unforwarded active alert and/or play decoded audio	• Momentarily at start and end of EAS Audio Playout
• Forward active decoded EAS upon closure	• During EAN Audio Playout (During Live EAN/NPT Audio Playout)
• Forward active RMT with original decoded audio	• During EAS Video Playout
• Preview RMT substitute alert audio	• During Main Serial EAS Playout
• Preview active decoded alert audio	• Momentarily at start of decoded EAS
• Re-enable forwarded EAS alert	• Momentarily at start of unforwarded, decoded EAS
• Originate cued alert	• Pending manual forward of decoded EAS
• Hold or Release Non-National EAS alerts	• Pending acknowledgement of unforwarded, active decoded EAS
• Allow or Block net/serial interface operation	• During EAS alert cued (confirm general origination)
• Light Front Panel Alert LED while closed	• During hold of EAS until GPI closure
• Toggle Global Auto Forward mode upon closure	• During hold of EAS during GPI closure
• Toggle Station Auto-Forward mode closure	• During Internal Balanced Audio Playout
	• During Audible parts of segmented live EAS Audio
	• During audio preview
	• During Global Auto-Forward mode enabled
	• During Station Auto-Forward mode enabled

Table 2. Available input (left) and output (right) selections.

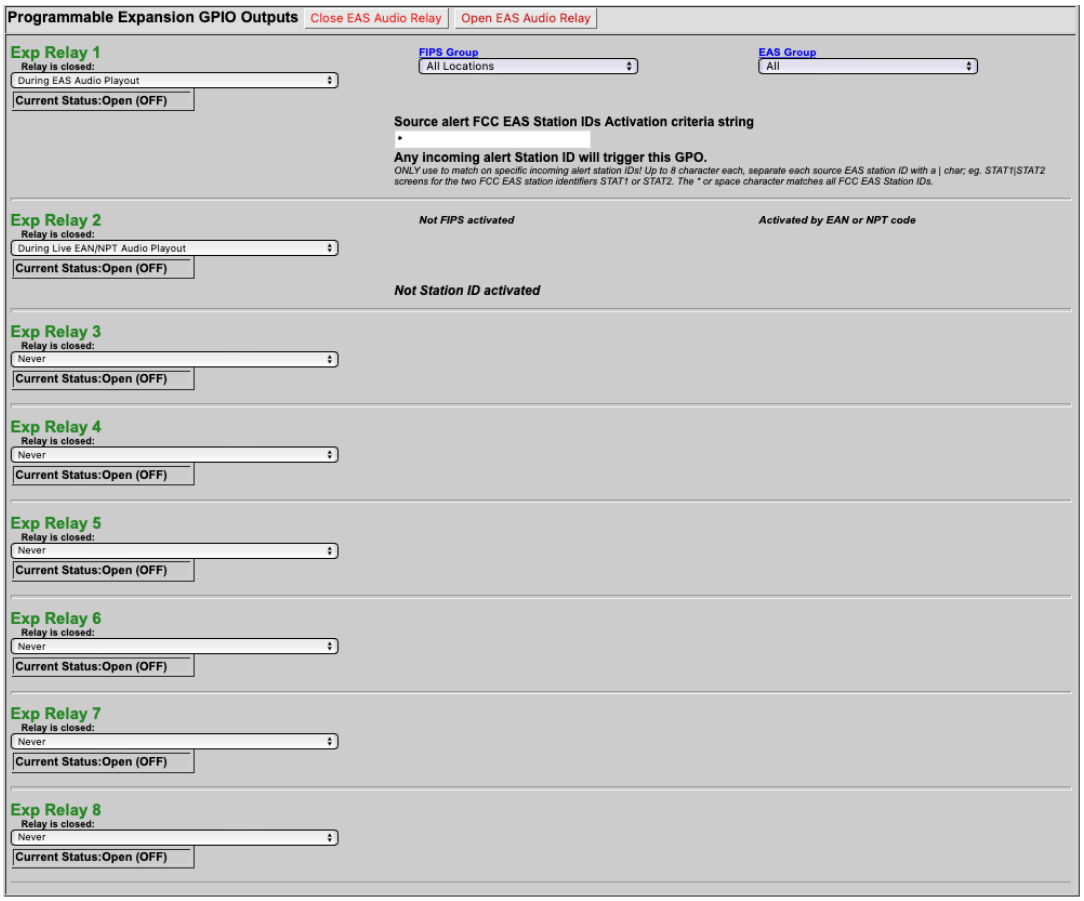
The GPIO inputs are labeled **Exp Input 1 – 8**. Each input has an **Input Action** pull-downmenu where users select the desired action based on triggering that input. The pull-down menu options are the same as the GPIO Input 1 selections. The **Current Status** [Open (OFF) or Closed (ON)] is displayed just below each **Input Action** pull-down menu.



Setup > GPIO > Expansion GPIO – input Examples

The GPIO outputs are labeled **Exp Relay 1 – 8**. Each output has a **Relay is closed** pull-down menu where users select the desired action to close the associated relay. The pull-down menu options are the same as the GPIO Output 1 Relay selections and are listed in Table 2. The **Current Status** [Open (OFF) or Closed (ON)] is displayed just below each **Relay is closed** pull-down menu.

After selecting an option from the **Relay is a closed** pull-down menu, **FIPS Group**, **EASGroup** and **Station ID** filtering is available for most options. Two buttons are located at the top of the table for testing GPIO output relays. The firstbutton, **Close EAS Audio Relay** sends out a command to close all relays programmed to EAS audio playout. The companion button, **Open EAS Audio Relay**, sends the commandto open all relays programmed for EAS audio playout.



Setup > GPIO > Expansion GPIO – Output Examples

The actions can be tied to alert FIPS Groups, EAS Groups, and specific EAS Station IDs. To add FIPS code filtering, click the desired selection from the **FIPS Group** pull-down menu. Active alerts containing any FIPS codes in the selected FIPS Group will trigger that relay (close the contact) while the associatedcondition is true. Repeat the same process by selecting an EAS code group from the **EAS Group** pull-down menu. When selecting “All” from either the FIPS Group or EAS Group pull-down menus, no filtering will occur.

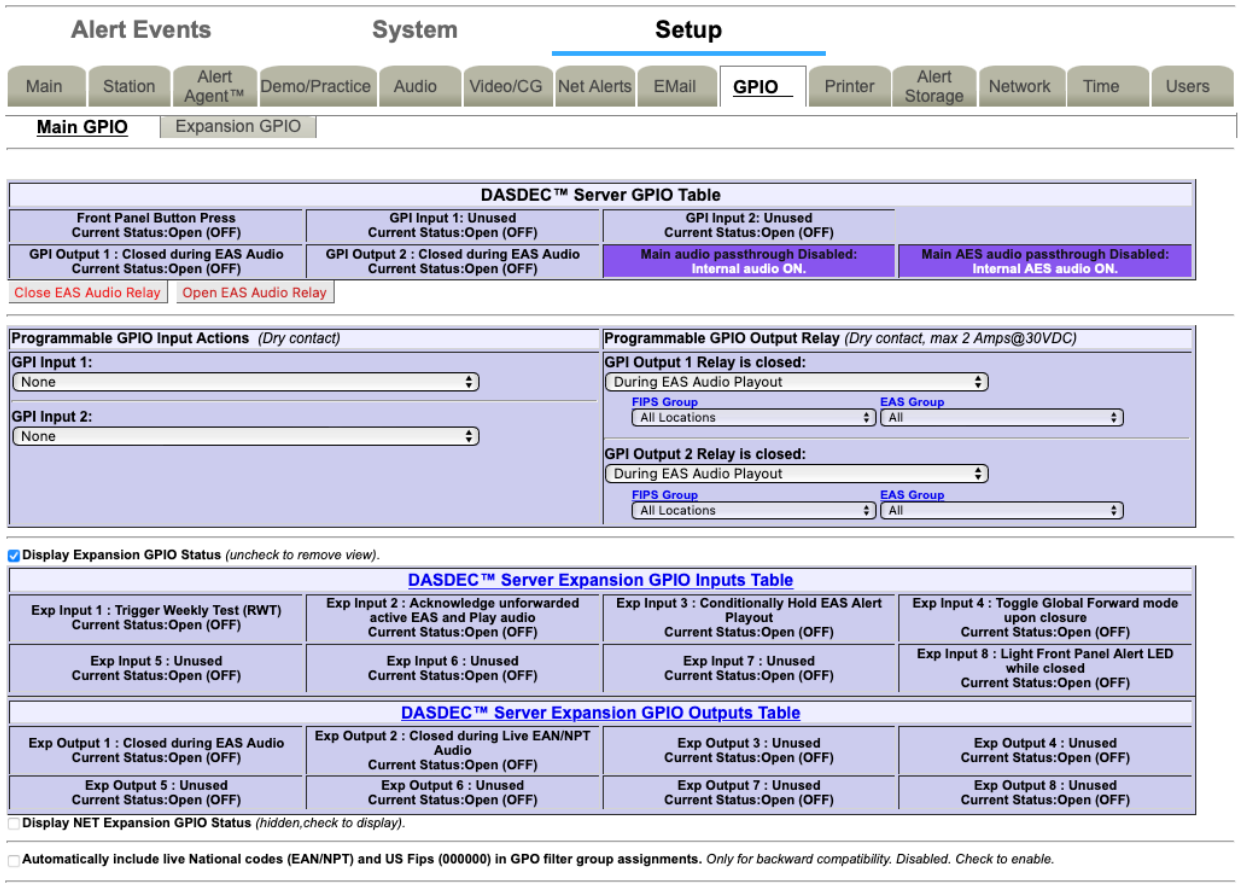
The default value in the **Source alert FCC EAS Station IDs Activation criteria string** is an asterisk (*). This is a wildcard that will not filter for specific Station IDs. Only enter text in this field to match specific incoming alert Station IDs. Upto 8 characters each, separate each source EAS station ID with a vertical bar (|) character (e.g. STAT1|STAT2 screens for the two FCC EAS station identifiers STAT1 orSTAT2).

At the top of the **Programmable Expansion GPIO Outputs** area are two options, Close EAS Audio Relay and Open EAS Audio Relay. These buttons only apply to the expansion relays configured to close *During EAS Audio Playout*. Selecting the Close EAS Audio Relay will close all GPIO Outputs configured to close *During EAS Audio Playout*.

Monitoring Expansion GPIO Configuration and Status

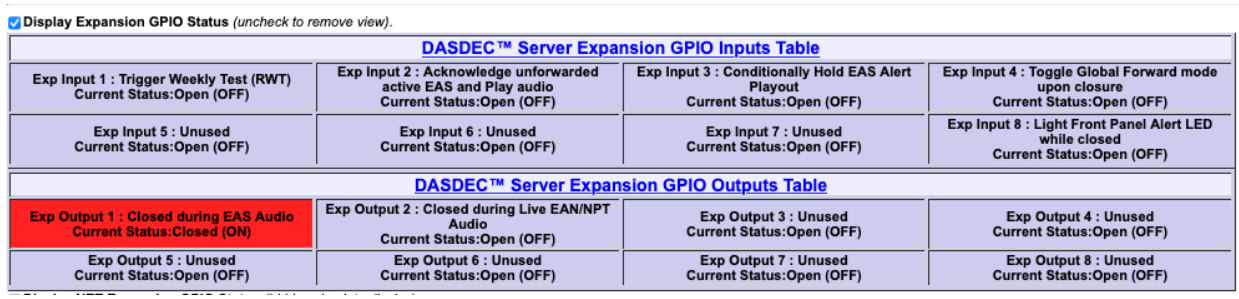
The DASDEC provides a single screen to display the settings and status of all GPIO configurations. Go to the **Setup > GPIO > Main GPIO** page. At the top of the page is the **DASDEC™ Server GPIO Table,** which displays the current settings and state of the two integrated GPIs and GPOs. Further down the page is a checkbox

Display Expansion GPIO Status Checking this box provides a similar table for all the expansion GPIs and GPOs.



Setup > GPIO > Main GPIO: Expansion GPIO Status Display

When any relay is closed, its location on the table will appear **RED,** as shown below:



Setup > GPIO > Main GPIO: Expansion GPIO Status Display (Closed Relay)

It is always advisable to test any settings with the any associated upstream or downstream equipment to ensure proper operation during an actual alert.