ASL, Pharmagraph Division, CC2044 Relay Output Module

07 Aug 2012

## **INSTALLATION AND OPERATING MANUAL**

# **CC2044 Relay Output Module ASL, Pharmagraph Division**

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#### **REVISION HISTORY**

Date	Revision	Updated by	Detail
10 Nov 2008	1.00	K.J.McWilliam	Created
08 Sep 2010	1.01	K.J.McWilliam	Added re-transmit mode.
			Added General Alarm Module usage description.
19 Jul 2012	1.02	K.J.McWilliam	Added RS485 bus pull up and pull down
			description.
			Corrected relay contact naming.
07 Aug 2012	1.03	J McCollin	Added Watchdog modes>
M:\Pharmagraph Products\Series 2000\CC2044\Manuals and datasheets\CC2044 Relay Output Module-IOM.doc			



## 1 INTRODUCTION

This document constitutes the Installation Operating Manual for the CC2044 Relay Output Module based on the 21081 PCB Assembly.

The CC2044 Relay Output Module combines 4 relay output channels and 4 digital input channels typically used to form an easy to wire interface for up to 4 vacuum pumps or solenoid valves used to provide vacuum for remote airborne particle counters. The CC2044 can also be used to implement the 'General Alarm Module' (GAM) or 'Zone Alarm Module' (ZAM) within an enVigil system. In these cases the relays are used to drive red, amber, green and sounder devices to indicate the alarm state of the system.

The CC2044 is powered by 24Vdc and communicates with the host PC using an RS485 serial communications bus.

## 2 CC2044 OPERATION

## 2.1 DC Power Connection

Connect a 24VDC power supply to header JP1.

JP1 pin no.	Description
1	+24VDC
2	0V

The PCB has a yellow LED (D2) located close to JP1 that illuminates while 24V is applied.

A second yellow LED (D7) located in front of D2 illuminates while the on-board 5V rail is healthy.

## 2.2 Setting the Device Address

Two binary-coded-decimal address switches on the 21081 PCB Assembly define the *host* RS485 address, and must be set in the range 0 to 31 to correspond with each device used in the configuration software. SW1 are the 'Units' and SW2 are the 'Tens'.

When used as a General Alarm or Zone alarm module, the CC2044 modules must also be set to the correct address on the Series 2000 RS485 bus. There can only be one General Alarm module on the bus, but there may be multiple Zone Alarm modules present. The General Alarm Module resides at address 30, while Zone Alarm Modules begin at address 40. Please refer to the enVigil Lite or enVigil PnP Operating manual to determine the exact addresses needed.

NOTE: The address switches are also used to configure some special mode selections such as 'Self-test' and 'Re-transmit' modes (see section 2.9). These addresses (96 and above) should not be used in normal operation.

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### 2.3 Host Communications Interface

The host RS485 bus from the PC (or Serial Device Server if used) should be looped into and out of each relay output module in turn, until the last module is reached.

It is often necessary to provide RS485 'bus bias' i.e. pullup of the 'A' signal and bus pulldown of the 'B' signal in order to provide reliable communications, however, this pullup/pulldown should only be enabled once on each RS485 bus. If the RS485 interface or Serial Device Server cannot provide this facility, then you can switch on SW3 positions 3 and 4 to enable this bus bias. Alternatively, this facility can be implemented by using the Series 2000 Interconnect boards (see section 4).

The controller PCB uses JP2 for both RS485 in and out. In a simple system supporting up to four pumps, there will only be one cable needed in to the RS485 in.

JP2 Pin no.	Signal Description
1	A
2	В
3	Screen

The host RS485 port has two diagnostic LEDs to assist in on-site fault finding. The red LED (D3) pulses for 10ms for each *received* character and the green LED (D4) pulses for each *transmitted* character.

## 2.4 Aux Communications Interface

The 'Aux' RS485 interface can be used in one of two ways; as a connection to a second PC as part of a fault-tolerant system, or more commonly as an RS485 re-transmitter that acts as a bus extender for the host RS485 interface. When acting as a re-transmitter, the Aux RS485 bus allows greater distances and/or greater number of modules to be accommodated.

JP3 Pin no.	Signal Description
1	A
2	В
3	Screen

The aux RS485 port has two diagnostic LEDs to assist in on-site fault finding. The red LED (D5) pulses for 10ms for each *received* character and the green LED (D6) pulses for each *transmitted* character.

If you require RS485 bus bias on the Aux bus, then you can switch on SW3 positions 5 and 6 to apply the necessary pullup and pulldown. Bus bias should be applied only once per RS485 bus.

## 2.4.1 Aux Interface as part of a fault-tolerant system

The auxiliary RS485 bus from the second PC (or Serial Device Server if used) should be looped into and out of each module in turn, until the last module is reached.

In this mode JP3 is used for Aux RS485 in and out.

#### 2.4.2 Aux Interface as a host RS485 re-transmitter

When used as a re-transmitter for the host RS485 bus, the *last* module that forms part of the first bus segment should be set to 'Re-transmit' mode (see section 2.9) and the Aux 485 interface from that module should be connected to the host RS485 of the *first* module that forms part of the second bus segment.

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## 2.5 Relay Outputs

The board has four relay switched outputs typically used to drive external contactors which in turn drive the vacuum pumps. Each on board relay has a red LED in series with its coil that indicates when the relay is successfully energised.

For convenience and flexibility a 24V signal and a 0V signal are available in addition to the relay contacts at each relay output headers.



To drive a contactor directly, a jumper connection should be fitted between pins 1 and 2 of the connector and the contactor coil fitted between pins 3 and 4. An external diode should be fitted across pins 3 (cathode) and 4 (anode) to catch the fly-back voltage generated by the coil as the contact opens (if one is not already built-in to the contactor or coil).

JP100, JP101, JP102, JP103 Pin no.	Signal Description
1	+24V
2	Relay contact (Normally Open)
3	Relay contact (Common)
4	OV



## 2.6 Using CC2044 as a General Alarm Module or Zone Alarm Module

When used as a General Alarm or Zone alarm module, the CC2044 module must be at a specific address on the Series 2000 RS485 bus. There can only be one General Alarm module on the bus, but there may be multiple Zone Alarm modules present. Please refer to the enVigil Lite or enVigil PnP Operating manual to determine the address needed.

When used as a General Alarm or Zone Alarm Module it provides four relay outputs with dedicated functions as follows:

Relay channel no.	Condition required to close contact	Typical Usage
0	Any Alarm present	Red lamp
1	Any Warning present	Amber lamp
2	No Alarms/Warnings present	Green lamp
3	Any unacknowledged Alarms/Warnings present	Sounder

If an alarm is present on the system in addition to a warning, then both the red and amber lamps would be on. The red and amber lamps are however mutually exclusive with the green lamp. If any unacknowledged alarms or warnings are present then the sounder will be active, and all must be acknowledged before the sounder will be silenced.

The sounder can also be silenced by providing a contact closure across digital input (channel 4), although this does not acknowledge the alarm condition.

## 2.7 Watchdog Modes within the CC2044

From firmware version AF onwards, the CC2044 incorporates a number of watchdog modes. These are selected by SW3 Positions 0 and 1 which are labelled M0 and M1.

The CC2044 monitors the communications on both the Host and Aux ports. If no communications are received within a timeout period the watchdog is triggered and the outputs are set as defined below.

MO	M1	Action
Off	Off	No watchdog action. Outputs remain in last programmed state after communications stops
On	Off	Outputs all turn off if watchdog triggered
Off	On	Outputs 0 and 2 turn on and outputs 1 and 3 turn off if watchdog triggered. This is intended for use when module is used as a global or zone alarm module.
On	On	Output 1 is turned on during power up and remains whilst on despite any programming. If the module does not receive any communications for 30 seconds All outputs will turn off

The timeout periods are set to 30 seconds for the Host port and 60 seconds for the Aux port.



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#### 2.8 Digital Inputs

The board offers four digital inputs typically used as local pump control signals. However, when used as a General Alarm or Zone Alarm Module, Channel 4 is used to silence the alarm sounder. The inputs are designed to be used directly with a switch or contact closure and therefore have a 'wetting' voltage already applied and a current limit resistor in series.



If an input is switched on by applying a contact closure across pins 1 and 2 then the software driver automatically interprets this as the 'on' condition and will drive the particle counter or silence the sounder.

JP104, JP105, JP106, JP107 Pin no.	Signal Description
1	+24V
2	Digital input

## 2.9 Re-transmit Mode Selection

To enable or disable 'Re-transmit' mode or to enable 'Self-test' mode, some special addresses are used once at power-up only:

Address at power-up	Meaning
0 thru 31	Normal operation
97	Disable 'Re-transmit' mode
98	Enable 'Re-transmit' mode

For example, to enable 'Re-transmit' mode you must first set the switches to 98 then power the module off then on again. You must then set the address switches to the desired address, for example 05 for a General Alarm Module, then power the module off and on again before beginning normal operation.

The Re-transmit mode is non-volatile and will be retained through power cycles since it is stored in flash memory internal to the module.

## 2.10 Self-Test Mode Selection

Self test is normally reserved for factory use and is enabled by selecting address 99.

Address at power-up	Meaning
0 thru 31	Normal operation
99	Self-test mode: The board flashes the firmware version on two LEDs D5 (red) and D6 (green) then cycles around LEDs D3, 4, 5, 6 and 7, then the 4 relays in sequence 0, 1, 2, 3.

NOTE: The self-test transmits repeated character bursts on both the host and aux RS485 interfaces, therefore it should not be used in an operational system.

## 3 ORIENTATION OF HEADER CONNECTORS

To improve ease of installation, two part headers are used for all connections to the module. It is however, vital that the correct orientation of the two part connectors is observed. Pin 1 of the header on the PCB is always at the *left* when looking into the header with the PCB viewed from the edge. Failure to observe the correct orientation may result in damage to the system.



Orientation of pin 1 on two-part headers



### 4 USING SERIES 2000 INTERCONNECT MODULES

Where multiple Series 2000 modules are adjacent, the Series 2000 Interconnect Modules help provide a simple and convenient method of delivering 24V power via a self-resetting (1 Amp) fuse and the host RS485 bus to each module. The Series 2000 Interconnect also provides a mechanism for attaching a RS485 bus bias module. This is often used to improve the reliability of RS485 by defining the signals levels on the RS485 bus when no device is driving it. The address switches and diagnostic LEDs remain accessible through an aperture in the Interconnect Module.

Each Series 2000 Module ships with an 'Interconnect Module' and a 'Jumper module' that may be used to connect to the previous Series 2000 module as shown below:



## 4.1 HEADER CONNECTORS DIAGRAM



