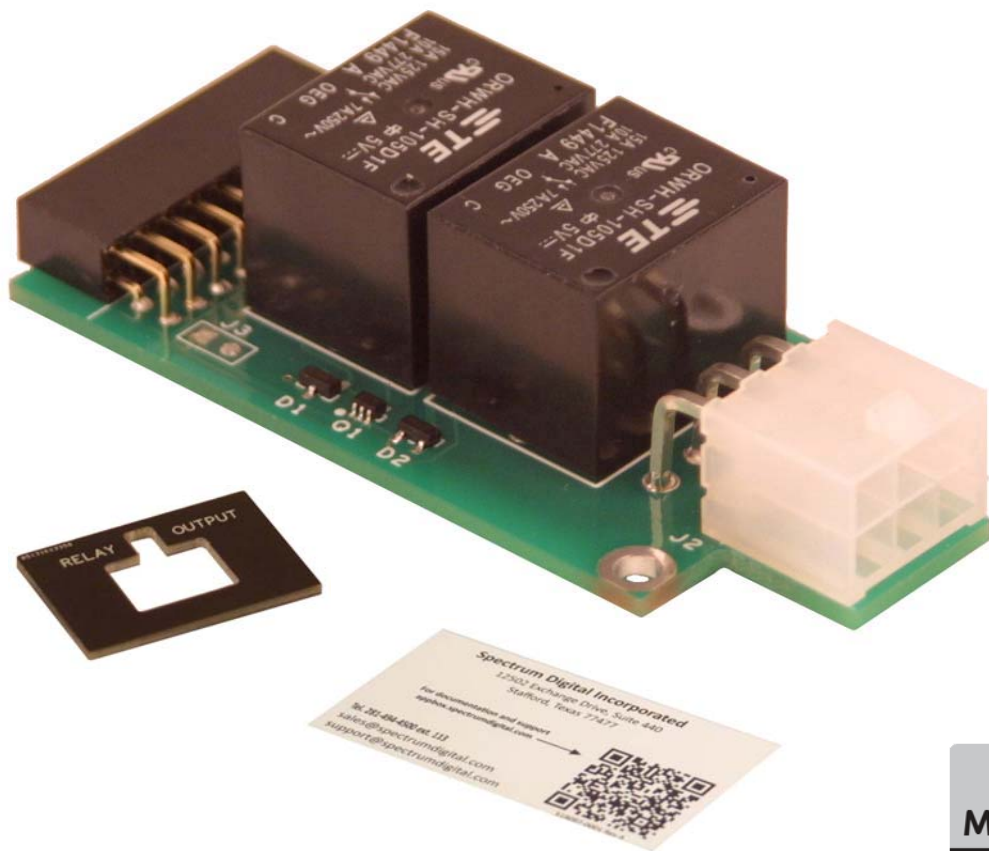




# ApIO Relay Module System User's Guide



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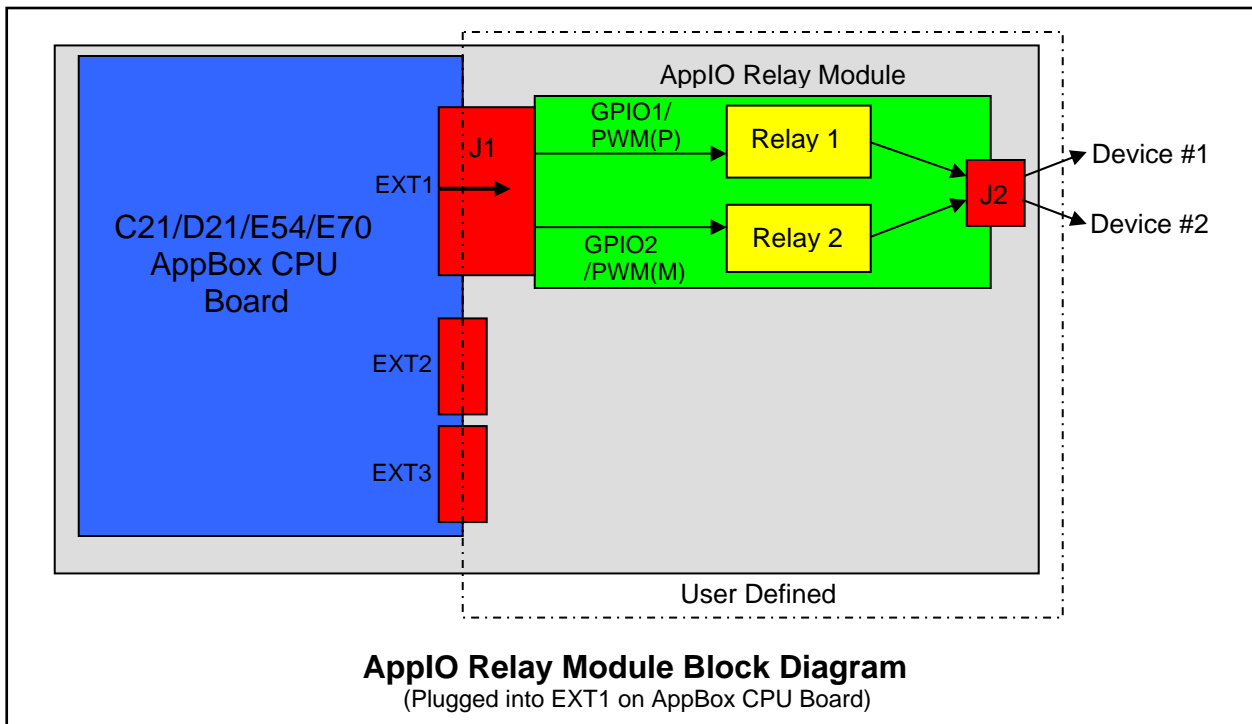
## 1.0 Introduction

This document describes the features of the AppIO Relay Module. The AppIO Relay Module is designed to be used with a Spectrum Digital AppBox in an industrial application. The AppIO Relay Module can be plugged into any of the 3 expansion connectors on the AppBox.

### 1.1 AppIO Relay Module Features

This AppIO Relay Module has the following features:

- Provides two (2) relay outputs (SPDT, +5 volts, at 10 amps)
- Compatible with Spectrum Digital C21, D21, E54, and E70 AppBox Boards and Atmel X PLAINED processor boards
- Power provided by App Module
- Operates 0 - +70C



### 1.2 AppIO Relay Module Applications

The AppIO Relay Module can be used in the following applications:

- Control DC circuits in an industrial control system
- Up to 6 relays per AppBox can be configured
- Brings relays into IoT applications, new edge devices

### 1.3 AppIO Relay Module Product Contents

The following items are contained in the AppIO Relay Module (Part/SKU #: 703916-0001) product:

- AppIO Relay Module
- Relay connector mating connector
- Knock out panel for relay output connector
- 2 mounting screws
- Product information card

### 1.4 AppIO Relay Module Accessories

The following AppBox products can be used with the AppIO Relay Module and ordered from Spectrum Digital or authorized resellers:

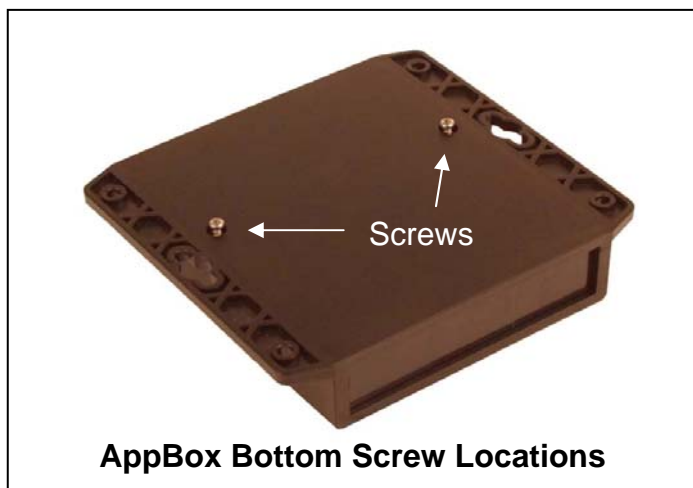
Accessory Description	Part/SKU Number
AppBox C21	703909-0001
AppBox D21	703910-0001
AppBox E54	703919-0001
AppBox E70	703911-0001

## 2.0 Installation

### 2.1 Installation of the AppIO Relay Module

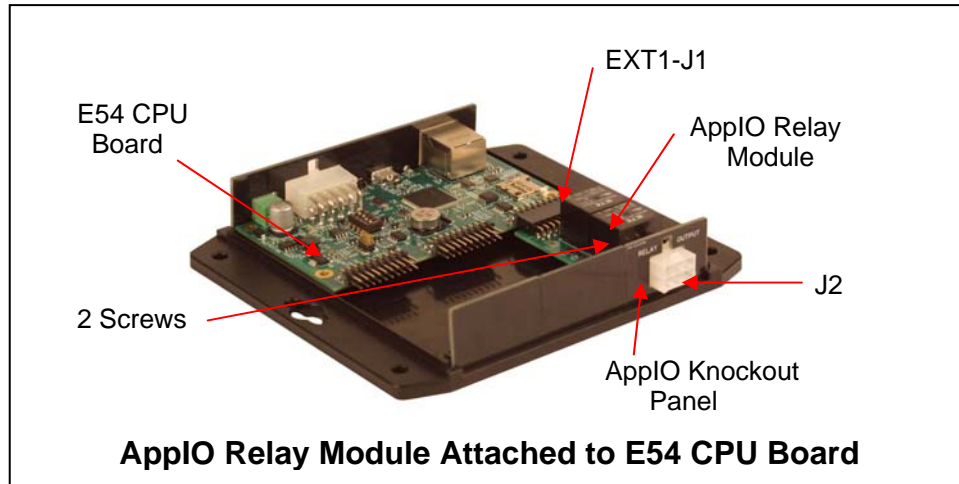
Listed below are the steps to install the AppIO Relay Module in an AppBox C21/D21/E54/E70:

1. Remove **ALL** power to the enclosure
2. Remove all interface connections attached to the installed AppIO Modules
3. Remove the connections (CAN/RS-485/LIN/USB/Enet) to the AppBox CPU Board
4. Turn the AppBox over and remove the 2 screws from the bottom of the enclosure as shown below

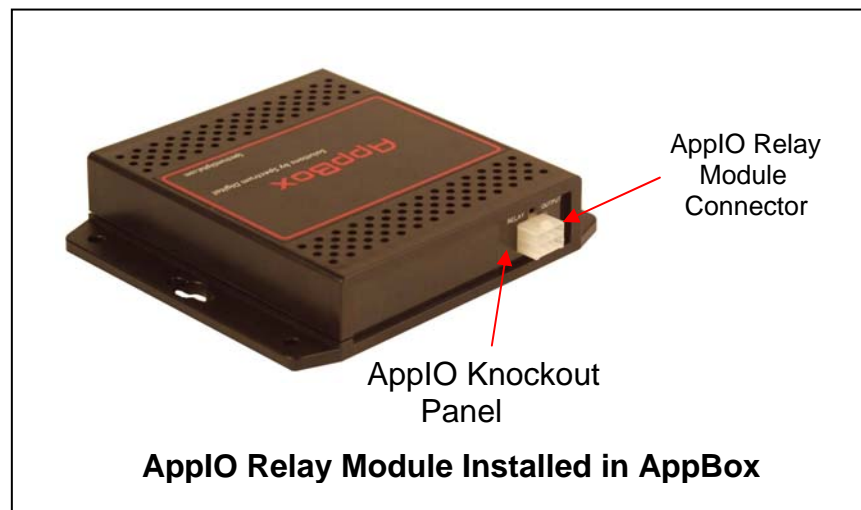


5. Turn the AppBox back over (label showing) and lift the top off the enclosure being careful not to lose the knockout panels
6. If necessary remove one or more existing AppIO Modules

7. Plug the AppIO Relay Module into an AppIO Module expansion connector (EXT1, EXT2, or EXT3)



8. Insert the knock out panel associated with the AppIO Relay Module
9. Secure the AppIO Module to the AppBox base with the 2 provided screws
10. Insert the knock out panels in any unused positions
11. Place the cover back over the AppBox CPU Board and AppIO Modules. Make sure the cover closes tight on both sides
12. Turn the AppBox over and insert the 2 screws back in and tighten until snug, do not over tighten/strip the screws

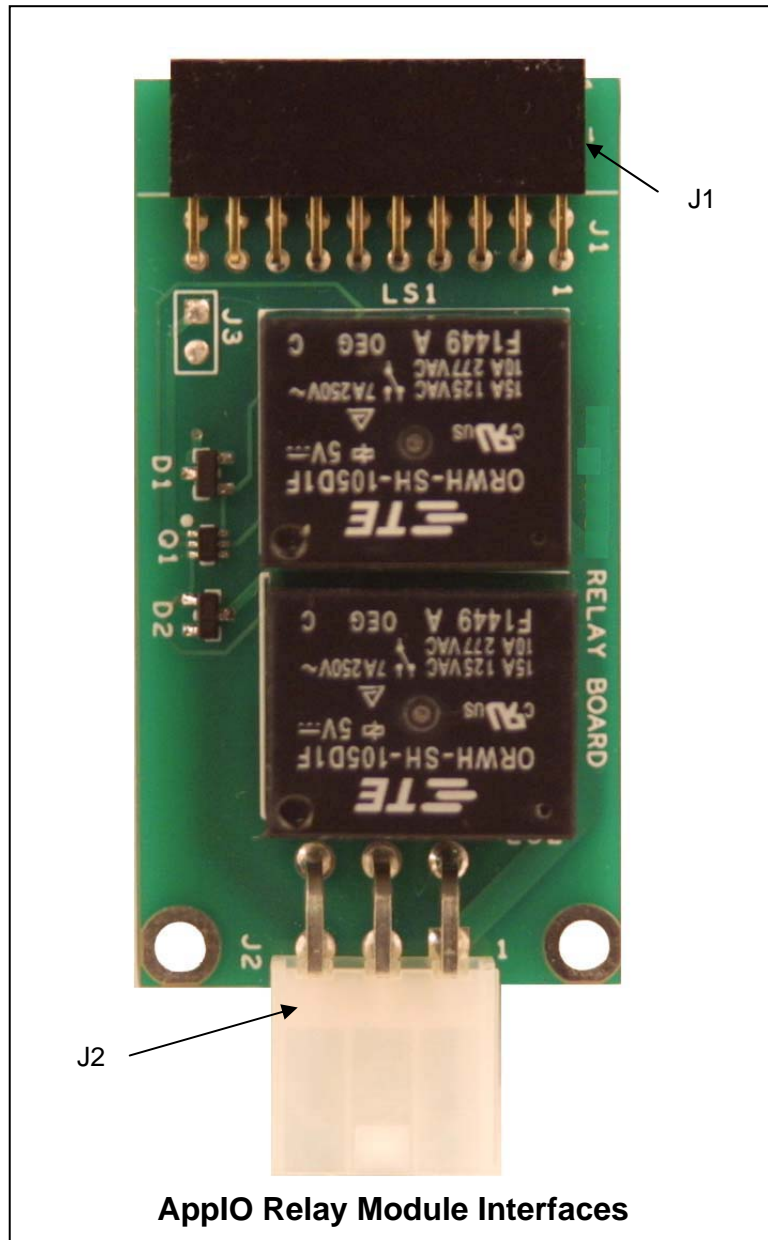


13. Re-attach the connections (CAN/RS-485/LIN/USB/Enet) to the AppBox CPU Board
14. Re-attach all interface connections to the AppIO Modules
15. Apply power to the AppBox

### 3.0 Interfaces

This section describes the interfaces on the AppIO Relay Module. These interfaces include the connectors, and jumpers.

The location of each of these interfaces is shown in the figure below:



The table below lists all the interfaces on the AppIO Relay Module.

AppIO RELAY MODULE INTERFACES	
INTERFACE NAME	TYPE OF INTERFACE
J1	Connector to AppBox CPU Board
J2	Connector to relays
J3	Connector to ground VDD_5V
JP1	SMT jumper(bottom)
JP2	SMT jumper(bottom)
JP3	SMT jumper(bottom)
JP4	SMT jumper(bottom)
JP5	SMT jumper(bottom)
JP6	SMT jumper(bottom)

### 3.1 Connectors

The following section describes the connectors on the AppIO Relay Module.

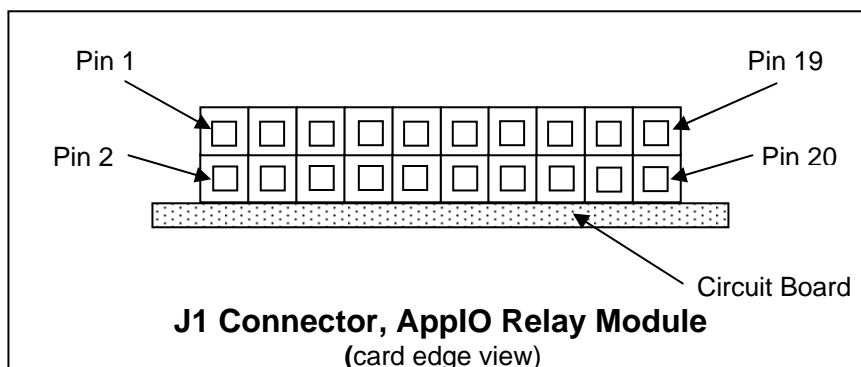
INTERFACE NAME	TYPE OF INTERFACE
J1	Connector to AppBox CPU Board, 20 position, 2 x 10
J2	Connector to relays, 6 position, 2 x 3



### 3.1.1 J1 Connector, AppBox CPU Board Interface

The J1 connector on the AppIO Relay Module can be plugged into any one of the 3 expansion connectors (EXT1, EXT2, or EXT3) on the C21/D21/E54/E70 AppBox CPU boards. The J1 connector is a 20 pin, 2 x 10 double row female right angle connector with centers on .1 inch (2.54 mm) centers.

The following diagram shows the physical layout of the J1 connector.

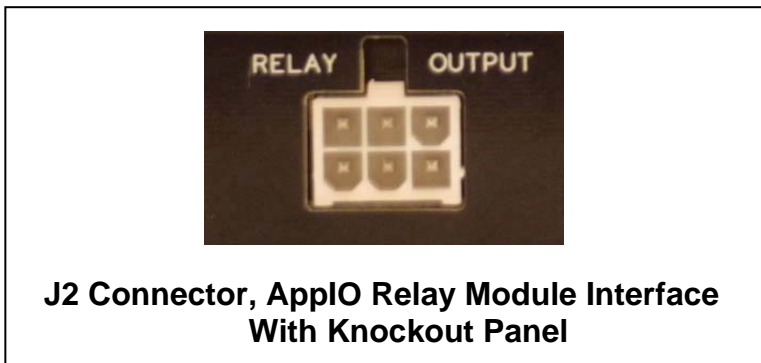


The following table shows the signals present on the J1 connector.

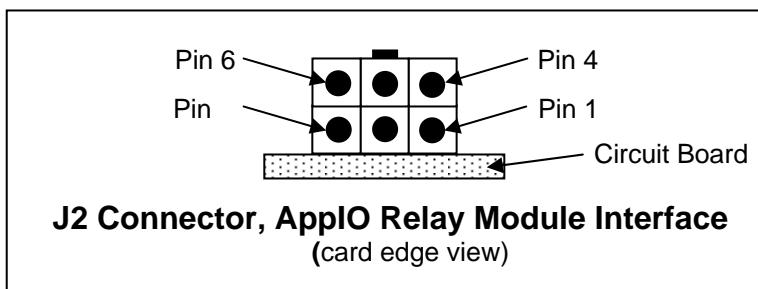
J1 Connector, AppIO Relay Module			
Pin #	Signal Name	Function	Shared Functionality
1	VDD_5V	+5 volts from AppBox CPU Board if AppIO Module jumper shorted	VDD_5V
2	DGND	Ground	Ground
3	No connect		
4	No connect		
5	GPIO1	General purpose I/O from AppBox CPU Board	
6	GPIO2	General purpose I/O from AppBox CPU Board	
7	PWM(P)	PWM(P) from AppBox CPU Board	
8	PWM(N)	PWM(N) from AppBox CPU Board	
9	No connect		
10	No connect		
11	No connect		
12	No connect		
13	No connect		
14	No connect		
15	No connect		
16	No connect		
17	No connect		
18	No connect		
19	DGND	Ground	Ground
20	No connect		

### 3.1.2 J2 Connector, Relay Output Interface

This section describes J2, the relay output connector. This connector has the outputs of 2 SPDT relays. Each relay can pull a 10 amp load at +5 volts. The J2 connector is shown with its knockout panel in the diagram below.



This is a 6 position (2 rows by 3 pins each) male connector. The bottom row of pins (1, 2, and 3) have the signals for the relay #1. The top row of pins (4, 5, and 6) have the signals for relay #2. The diagram below shows the physical layout of the J2 connector.

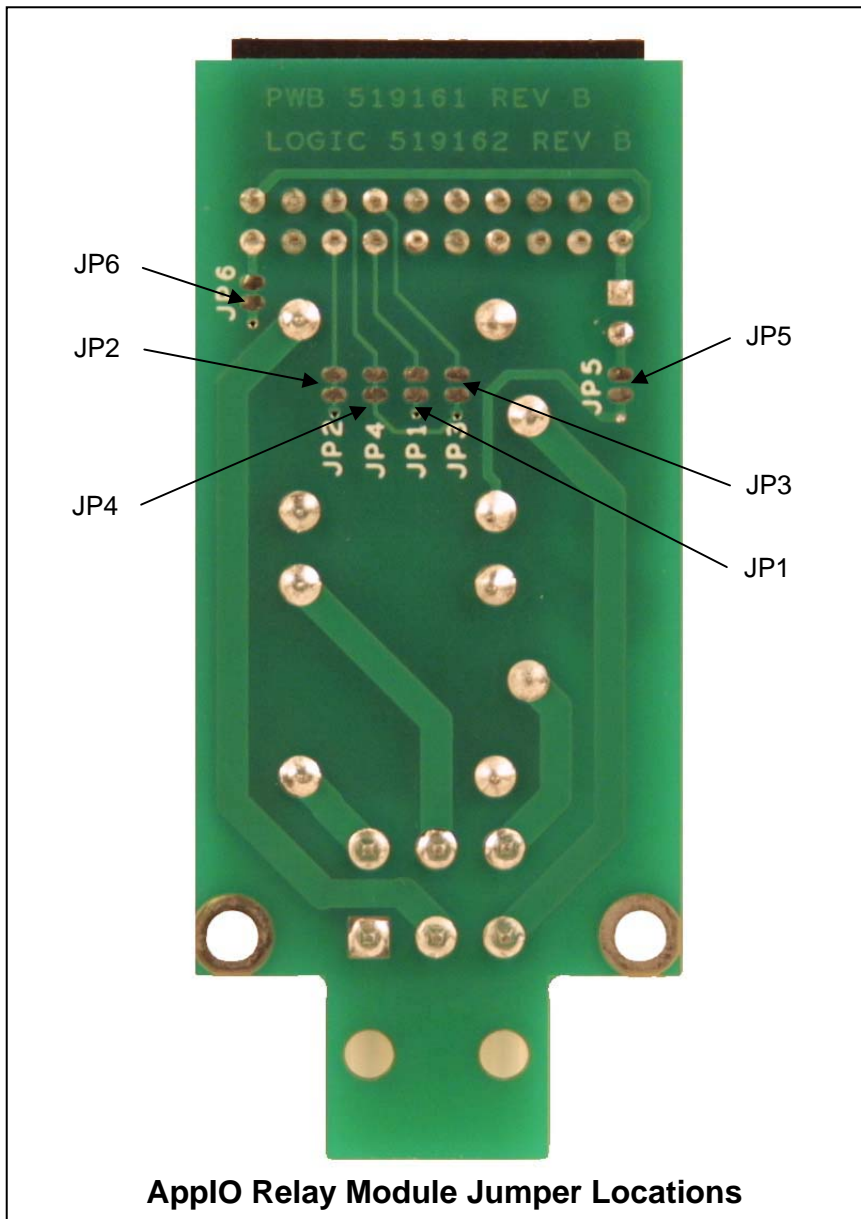


The following table shows the signals present on the J2 connector.

J2 Connector, Relay Output Interface	
Pin number	Signal name
1	NO1
2	NC1
3	CO1
4	NO2
5	NC2
6	CO2


### 3.2 Jumpers

This section describes the jumpers on the AppIO Relay Module. All jumpers are located on the bottom side of the Module. All jumpers are surface mount jumpers. The figure below shows the location of each jumper.




The table below describes the jumpers on the AppIO Relay Module.

JUMPER NAME	POSITION DESCRIPTION	FACTORY SHIPPED POSITION
JP1	Installed = PWM(P) drives relay #1	Open – see warning 1
JP2	Installed = GPIO1 drives relay #1	Installed – see warning 1
JP3	Installed = PWM(M) drives relay #2	Open – see warning 2
JP4	Installed = GPIO2 drives relay #2	Installed – see warning 2
JP5	Not used	Open
JP6	Installed = connects VDD_5V from App Module to the AppIO Relay Module	Installed



**WARNING 1 !**

Jumpers JP1 and JP2 are used in the same circuit. Only 1 should be installed. If both are installed the circuit could be damaged.



**WARNING 2 !**

Jumpers JP3 and JP4 are used in the same circuit. Only 1 should be installed. If both are installed the circuit could be damaged.

#### 4.0 Physical Characteristics

The physical characteristics of the AppIO Relay Module are described below:

AppIO Relay Module (without connectors): L: 2.25 in. (57.15 mm.) x W: 1.20 in. (30.48 mm.)

AppIO Relay Module (width with connectors): L: 2.75 in. (69.85 mm.)

AppIO Relay Module (maximum height): H: 0.75 in. (19.05 mm.)

Weight of Relay Module: 0.96 oz. / 0.027 kg

Operating Temperature: -0C to +70C

Storage Temperature: -40C to +85 C

Relative Humidity: 0 to 90% (non-condensing)

Maximum power consumption of controller Module: 500 ma. at +12 volts

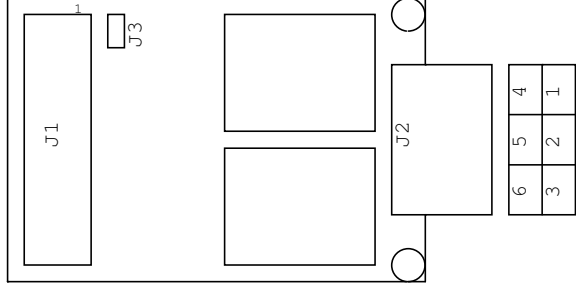
RoHS Compliant: Yes

#### 5.0 Schematics

The following pages have the schematics for the AppIO Relay Module.

NOTES :

1. JUMPERS JP1,JP2,JP3,JP4,JP6 ARE ON THE BACK OF THE BOARD
2. INSTALL J3 AND CUT JUMPER JP6 FOR EXTERNAL 5V POWER



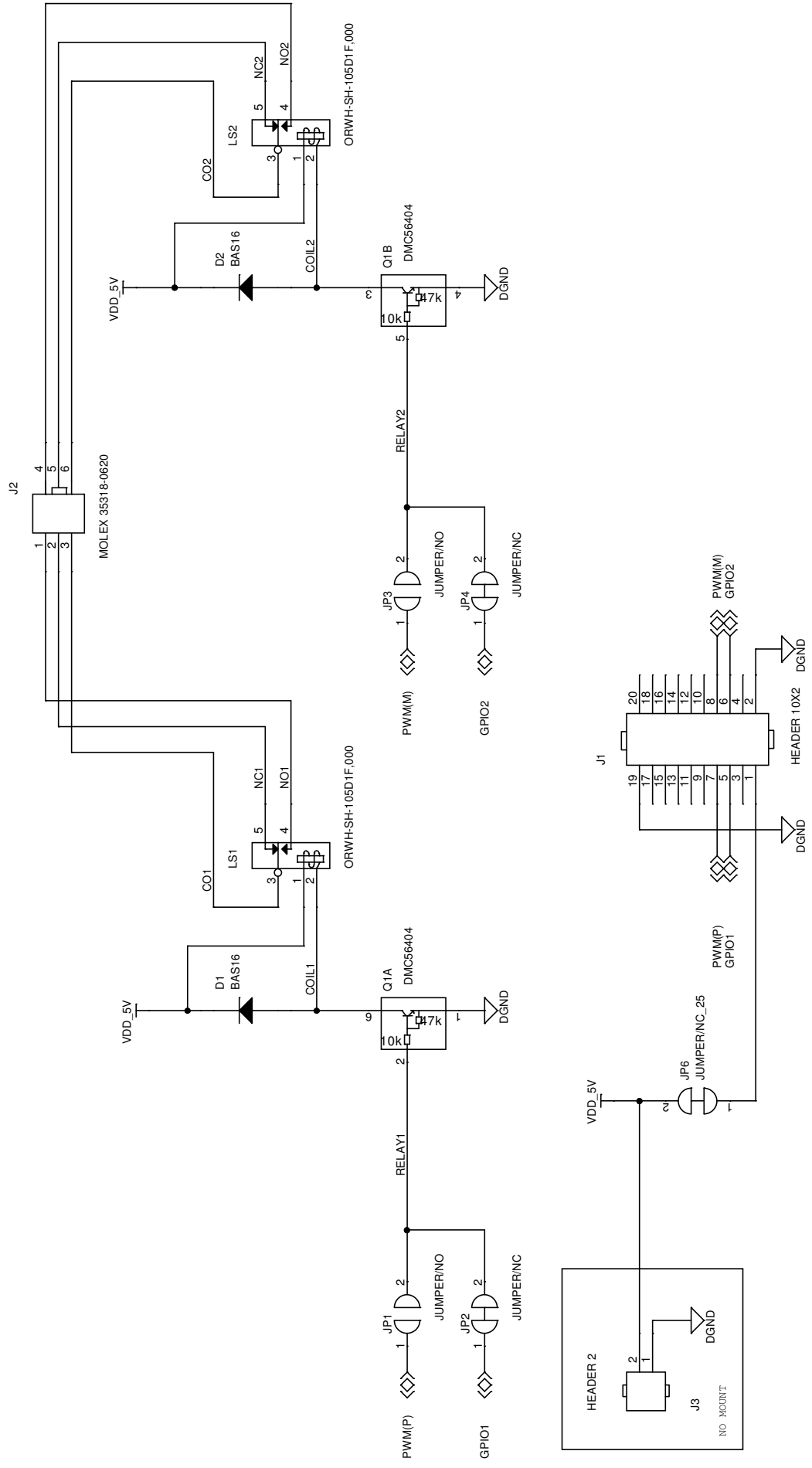
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Title: AppIO 2 Relay Module

Page Contents: TITLE

Size: B DWG NO 519162 Revision: C

Date: Friday, March 13, 2020 Sheet 1 of 2



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