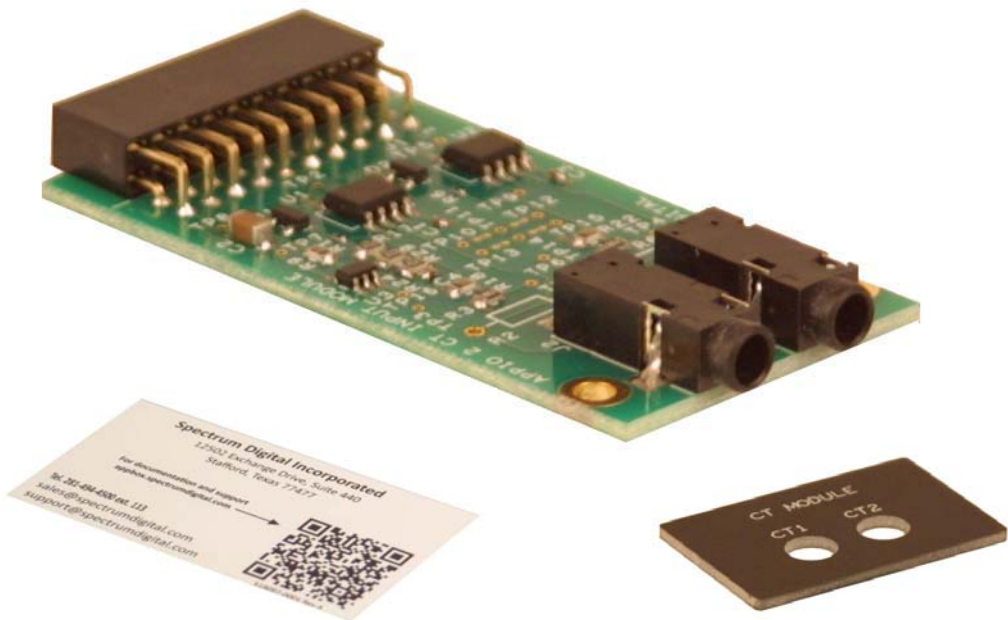




AppIO 2 CT Input Module System User's Guide



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519098-4001

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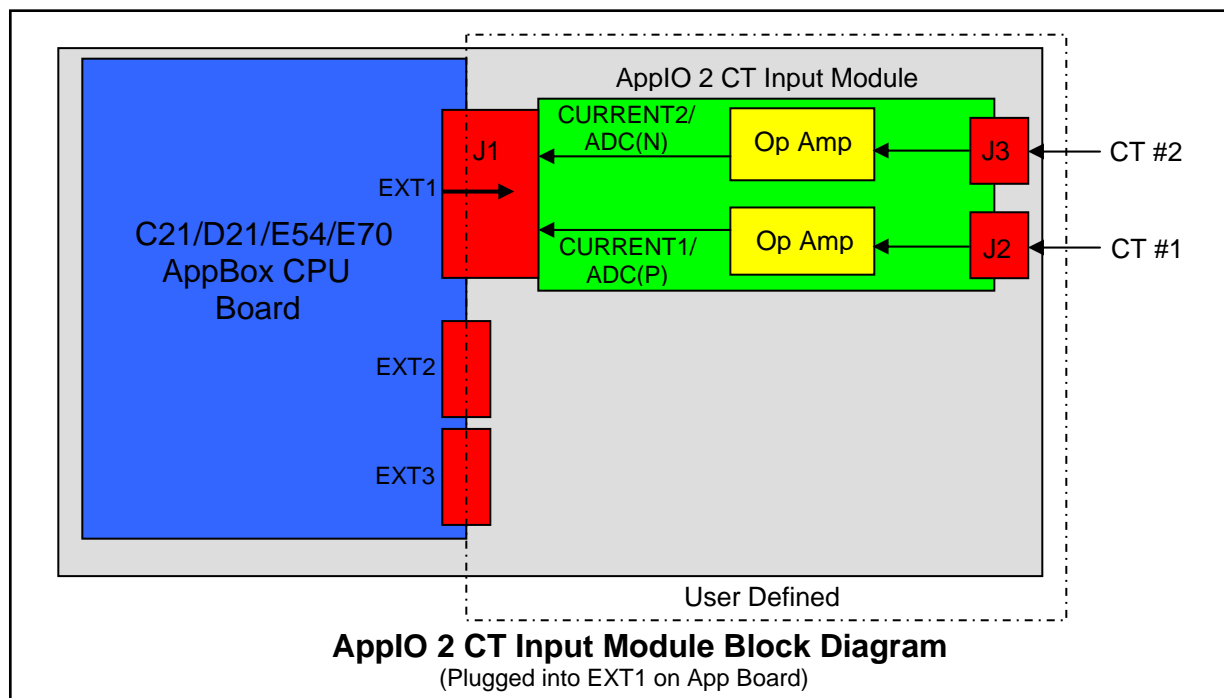
1.0 Introduction

This document describes the features of the AppIO 2 CT Input Module. The AppIO 2 CT Input Module is designed to be used in an industrial application with a Spectrum Digital AppBox. The AppIO 2 CT Input Module can be plugged into any of the 3 expansion connectors (EXT1, EXT2, or EXT3) on the AppBox.

1.1 AppIO 2 CT Input Module Features

This AppIO 2 CT Input Module has the following features:

- Provides two (2) CT Input
- Compatible with Spectrum Digital AppBox C21, D21, E54, and E70 CPU Boards and Atmel X PLAINED processor boards
- Power provided by AppBox CPU Board
- Operates 0 - +70C



1.2 AppIO 2 CT Module Applications

The AppIO 2 CT Module can be used in the following applications:

- Sensing current transformers (CTs) in a industrial system
- Brings CTs into IoT applications, new edge devices
- Up to 6 CTs can be clustered into one sampling AppBox

1.3 AppIO 2 CT Input Module Product Contents

The following items are contained in the AppIO 2 CT Input Module product (Part /SKU #: 703936-0001):

- AppIO 2 CT Input Module
- Knock out panel for 2 CT Input output connector
- 2 mounting screws
- Product information card

1.4 AppIO 2 CT Input Module Accessories

The following AppBox products can be used with the AppIO 2 Channel 2 CT Input Module and ordered from Spectrum Digital or authorized resellers:

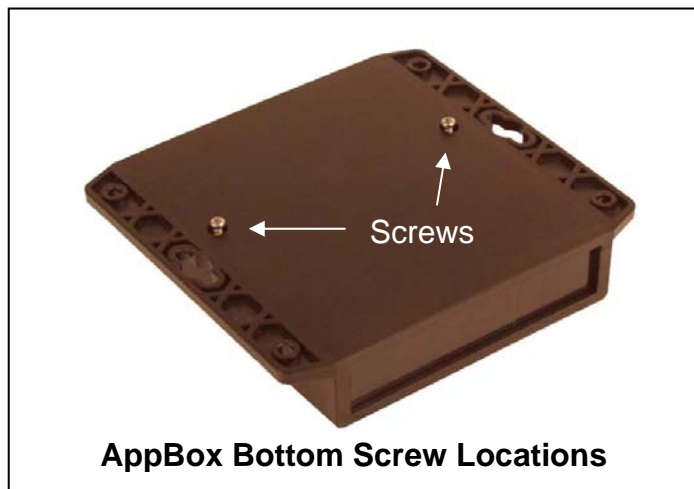
Accessory Description	Part/SKU Number
AppBox C21	703909-0001
AppBox D21	703910-0001
AppBox E54	703919-0001
AppBox E70	703911-0001

2.0 Installation

2.1 Installation of the AppIO 2 CT Input Module

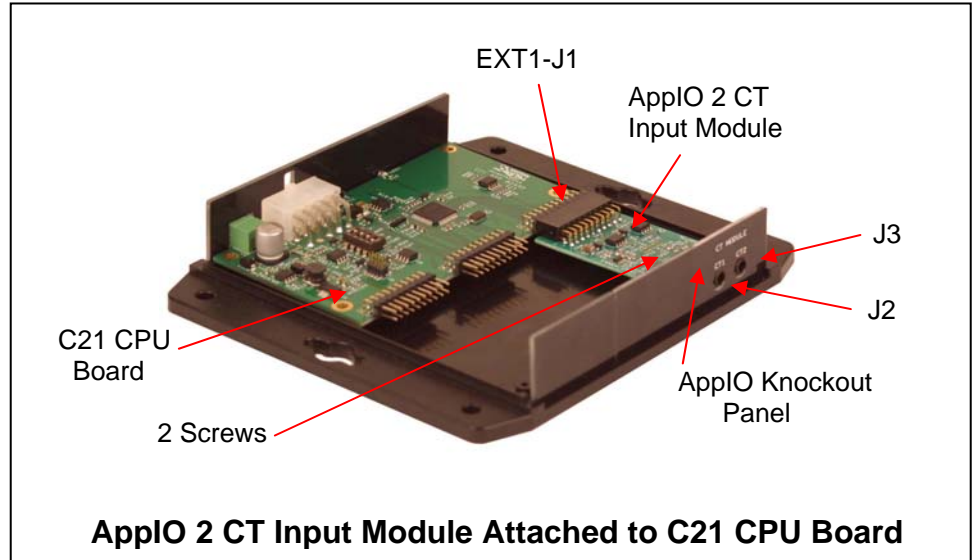
Listed below are the steps to install the AppIO 2 CT Input Module in an AppBox C21/D21/E54/E70:

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

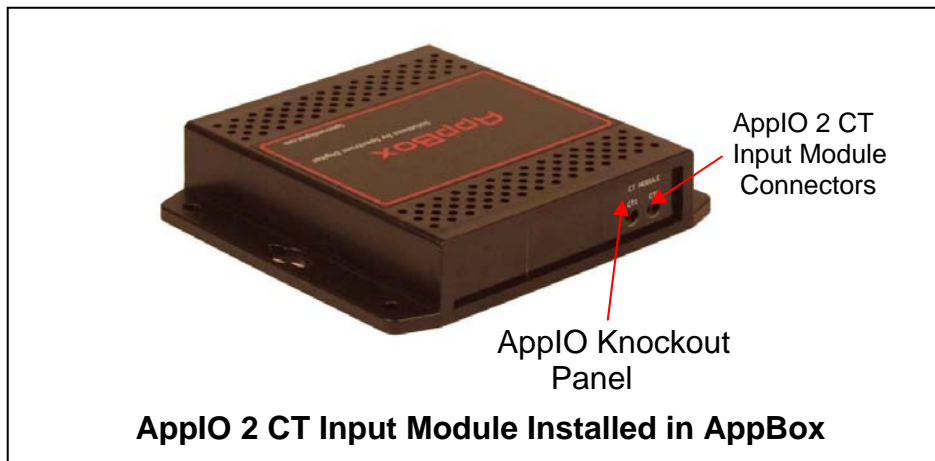


5. Turn the AppBox back over (label showing) and lift the top off the enclosure being careful not to lose the knockout panels
6. If necessary remove one or more existing AppIO Modules

7. Plug the AppIO 2 CT Input Module into an AppIO Module expansion connector (EXT1, EXT2, or EXT3)

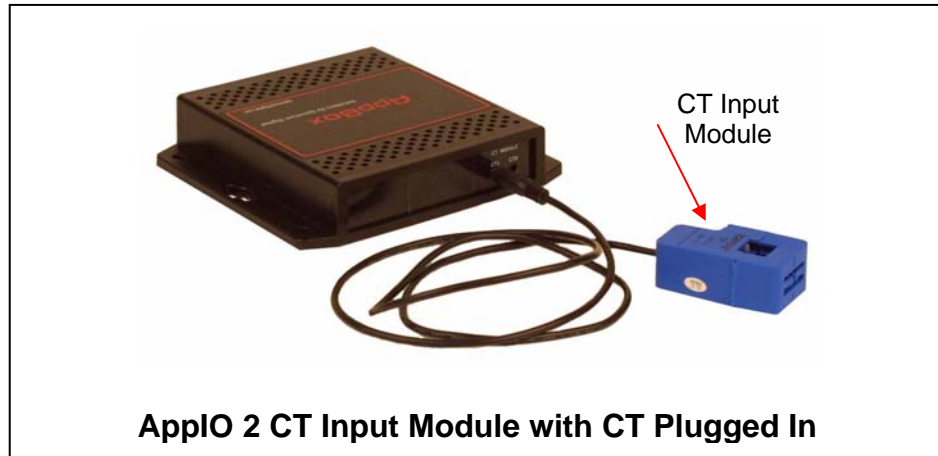


8. Insert the knock out panel associated with the AppIO 2 CT Input Module
9. Secure the AppIO Module to the AppBox base with the 2 provided screws
10. Insert the knock out panels in any unused positions
11. Place the cover back over the AppBox CPU Board and AppIO Modules. Make sure the cover closes tight 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. The diagram below shows the AppIO 2 CT Input Module with a YHDC SCT013-030 current clamp plugged in. This current clamp has a 30 A input with a 1 Volt output.

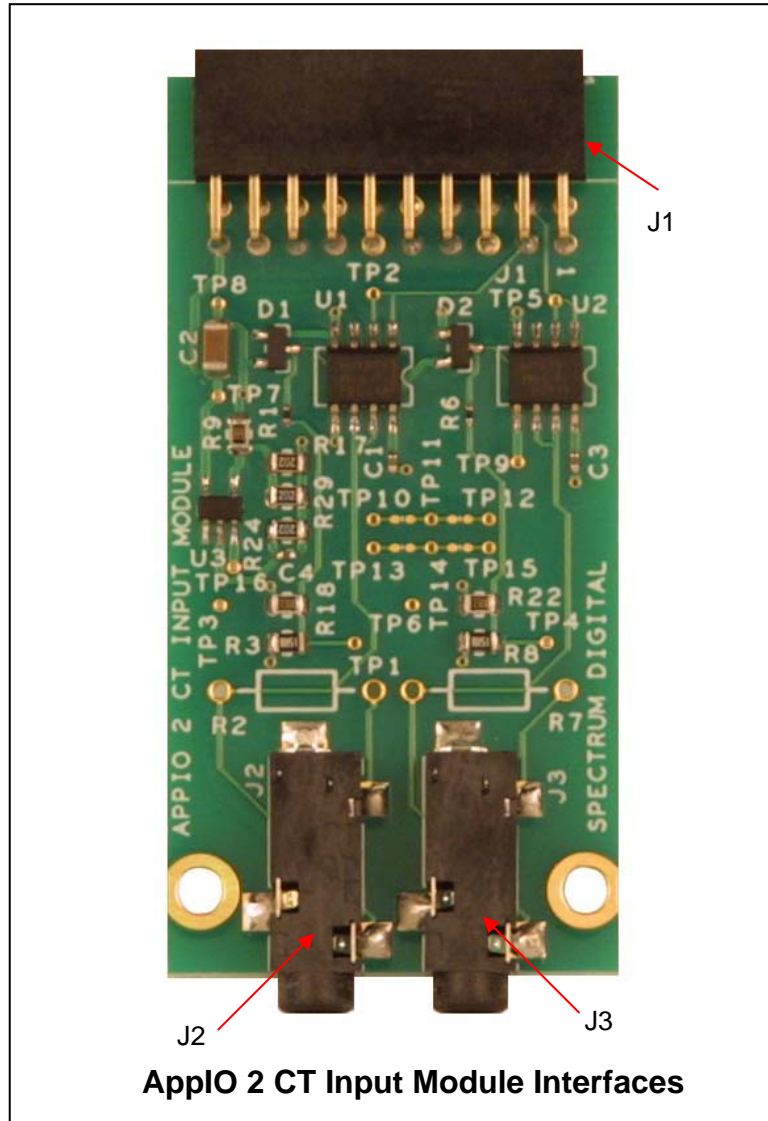


16. Apply power to the AppBox

3.0 Interfaces

This section describes the interfaces on the AppIO 2 CT Input Module. These interfaces include the connectors, and jumpers. The jumpers are shown in section 3.2

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



The table below lists all the interfaces on the AppIO 2 CT Input Module.

AppIO 2 CT INPUT MODULE INTERFACES	
INTERFACE NAME	TYPE OF INTERFACE
J1	Connector to AppBox CPU Board
J2	Connector from CT Input
J3	Connector from CT Input
JP1	Resistor select jumper
JP2	Resistor select jumper
JP3	Resistor select jumper
JP4	Resistor select jumper
TP1	Test point(top side)
TP2	Test point(top side)
TP3	Test point(top side)
TP4	Test point(top side)
TP5	Test point(top side)
TP6	Test point(top side)
TP7	Test point(top side)
TP8	Test point(top side)
TP9	Test point(top side)
TP10	Test point(top side)
TP11	Test point(top side)
TP12	Test point(top side)
TP13	Test point(top side)
TP14	Test point(top side)
TP15	Test point(top side)
TP16	Test point(top side)

3.1 Connectors

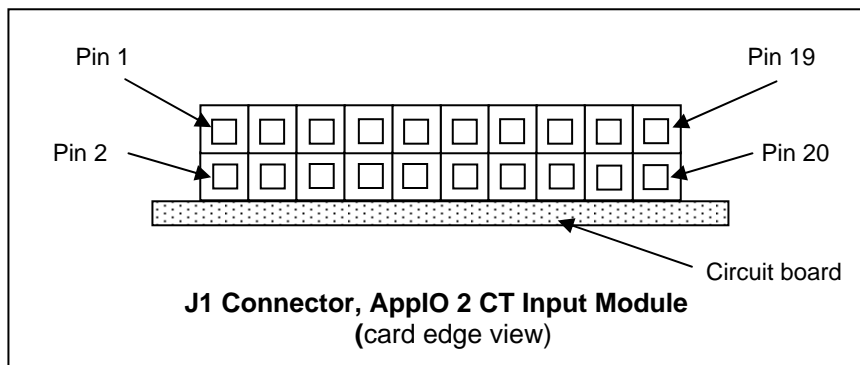
The following section describes the connectors on the AppIO 2 CT Input Module.

INTERFACE NAME	TYPE OF INTERFACE	MATING CONNECTOR
J1	Connector to AppBox CPU Board, 20 position, 2 x 10	
J2	Female Stereo Headphone Jack, 3.5 mm.	CUI SP-3501 Stereo Plug
J3	Female Stereo Headphone Jack, 3.5 mm.	CUI SP-3501 Stereo Plug

3.1.1 J1 Connector, AppBox CPU Board Interface

The J1 connector on the AppIO 2 CT Input 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 0.1 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 2 CT Input Module			
Pin #	Signal Name	Function	Shared Functionality
1	No connect		
2	DGND	Ground	Ground
3	CURRENT1	ADC(P) to AppBox CPU board	
4	CURRENT2	ADC(N) to AppBox CPU board	
5	No connect		
6	No connect		
7	No connect		
8	No connect		
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	VDD_3V3	+3.3 volts	VDD_3V3

3.1.2 J2, J3 Connectors, 2 CT Input Module Interface

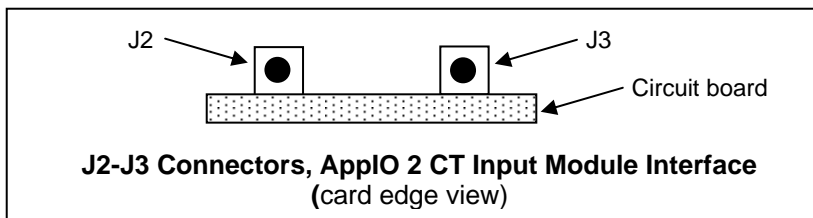
This section describes the J2 and J3 CT input connectors. These two connectors have identical circuitry. They both connect to an Op Amp and then are routed to an A/D channel on the AppBox CPU board. Both connectors are female stereo connectors. The 2 CT Input Module is compatible with the SCT013 family of current clamps produced by YHDC. The 2 CT Input Module is configured to work with all models except the SCT013-000 which would require a configuration change on the board. More information about these current clamps can be found on the following web page:

<http://en.yhdc.com/product/SCT013-401.html>

The J2 and J3 connectors are shown with its knockout panel in the diagram below.



The diagram below shows the physical layout of the J2 and J3 connectors.



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

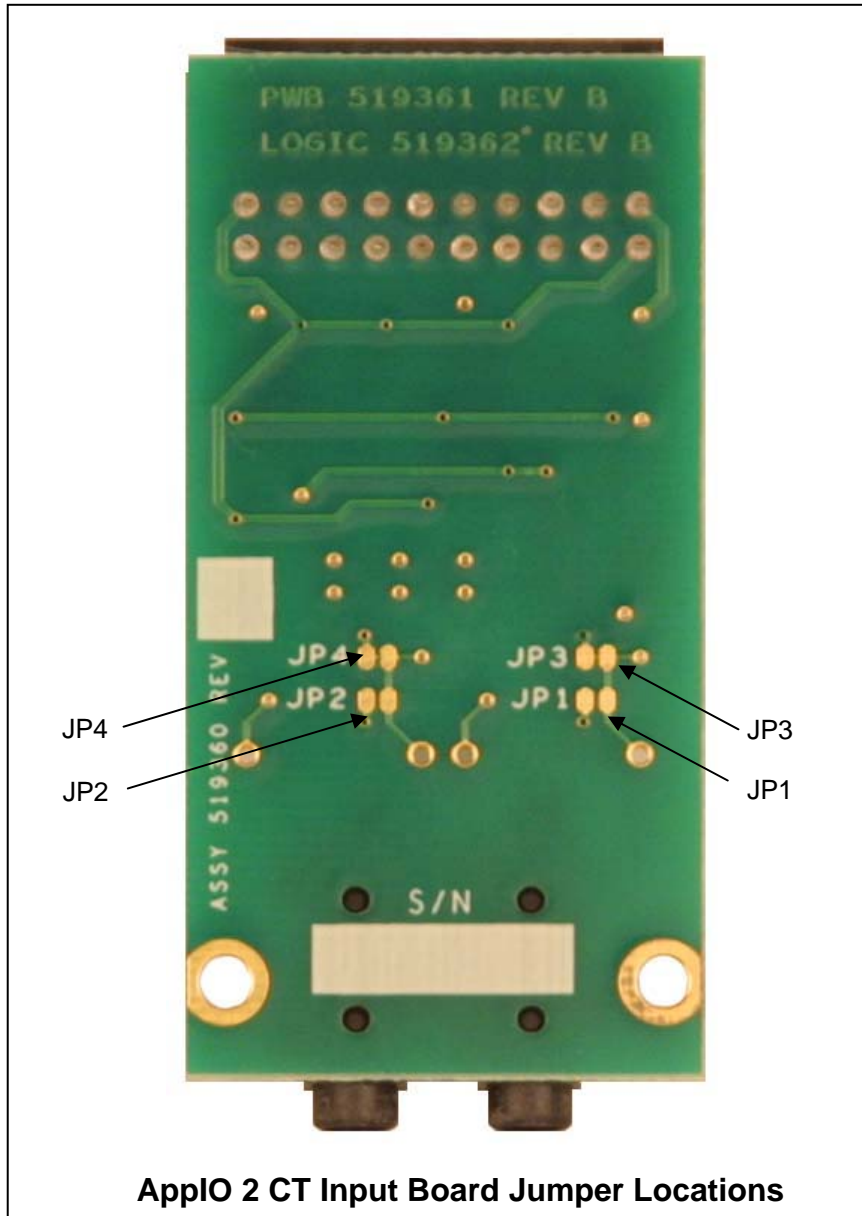
J2 Connector, CT Input	
Pin number	Signal name
1	VGND1
2	CT1
3	No connect
4	No connect

The following table shows the signals present on the J3 connector.

J3 Connector, CT Input	
Pin number	Signal name
1	VGND2
2	CT2
3	No connect
4	No connect

3.2 Jumpers

This section describes the jumpers on the AppIO 2 CT Input 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.

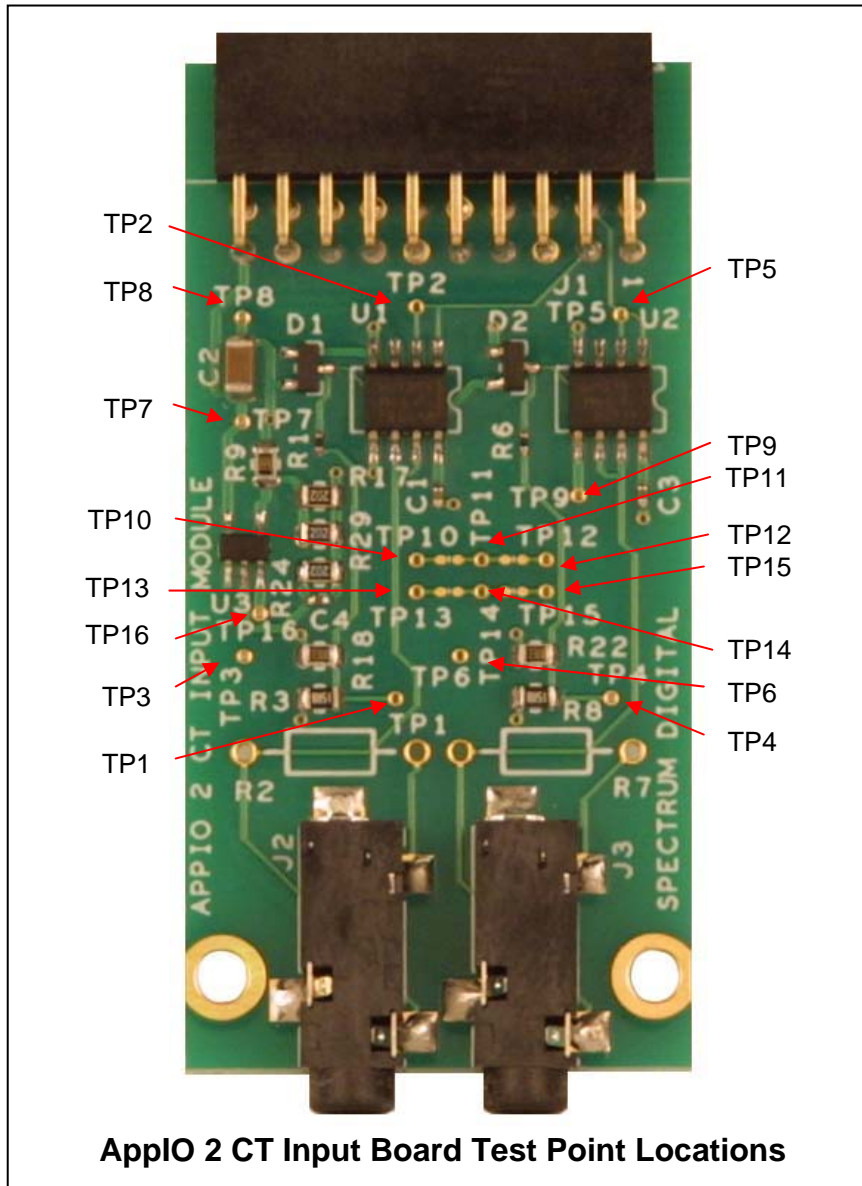


The table below describes the jumpers on the AppIO 2 CT Input Module.

JUMPER NAME	POSITION DESCRIPTION	FACTORY SHIPPED POSITION
JP1	Installed = Use R3 in circuit	Open
JP2	Installed = Use R8 in circuit	Open
JP3	Installed = Use R18 in circuit	Installed
JP4	Installed = Use R22 in circuit	Installed

3.3 Test Points

This section describes the test points on the AppIO 2 CT Input Module. All test points are located on the top (component) side of the Module. All jumpers are surface mount jumpers. The figure below shows the location of each test point.



The table below describes the test points on the AppIO 2 CT Input Module.

TEST POINT NAME	ATTACHED SIGNAL
TP1	J2, pin 2 (CT1) – U1A, pin 3 (CT1B)
TP2	U1A, pin 2 – CURRENT1
TP3	U1B, pin 6 - VGND1
TP4	J3, pin 2 (CT2) – U2A, pin 3 (CT2B)
TP5	U2A, pin 2 – CURRENT2
TP6	U2B, pin 6 – VGND2
TP7	J1, pin 19 – DGND
TP8	J1, pin 20 – VDD_3V3
TP9	R17, R29 in parallel, VREF
TP10	R25/R26 divider, no pop
TP11	R25/R26 divider, no pop
TP12	R25/R26 divider, no pop
TP13	R27/R28 divider, no pop
TP14	R27/R28 divider, no pop
TP15	R27/R28 divider, no pop
TP16	R17, R29 in parallel, VDD_3V3

4.0 Physical Characteristics

The physical characteristics of the AppIO 2 CT Input Module are described below:

AppIO 2 CT Input Module (without connectors): L: 2.25 in. (57.15 mm.) x W: 1.20 in. (30.48 mm.)

AppIO 2 CT Input Module (width with connectors): L: 2.75 in. (69.85 mm.)

AppIO 2 CT Input Module (maximum height): H: 0.75 in. (19.05 mm.)

Weight of 2 CT Input 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)

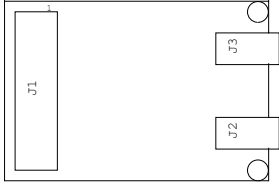
Maximum power consumption of controller board: 500 ma. at +12 volts

RoHS Compliant: Yes

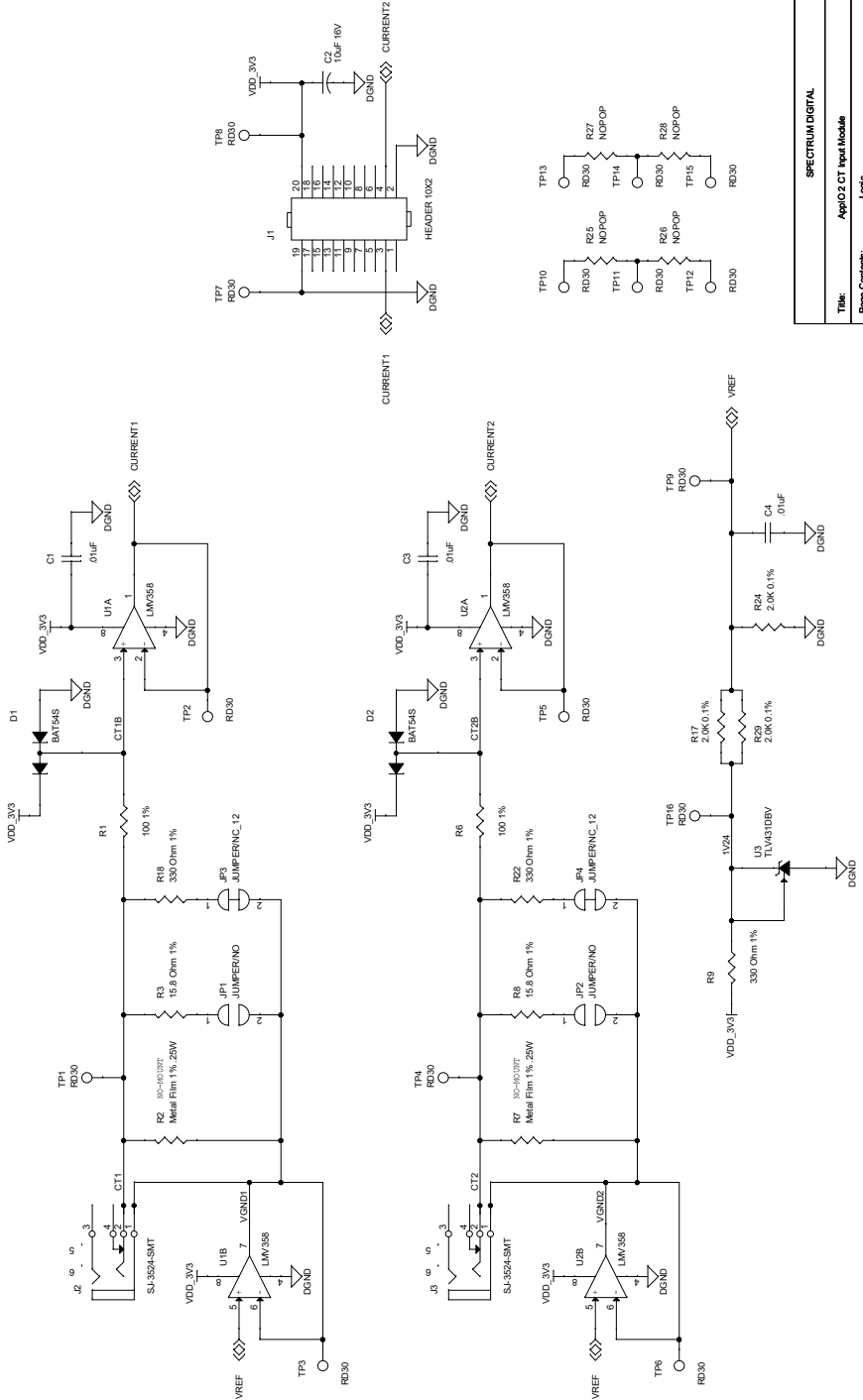
5.0 Schematics

The following pages contain the schematics for the 2 CT Input Module.

JF3/JF4	V-Output CT
JF1/JF2	I-Output CT



SPECTRUM DIGITAL INCORPORATED	
Title:	AppD 2 CT Input Module
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Revision:	B
Sheet 1 of 2	Sheet 1 of 2



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Title:	ApplQ2 CT Input Module
Page Contents:	Logic
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