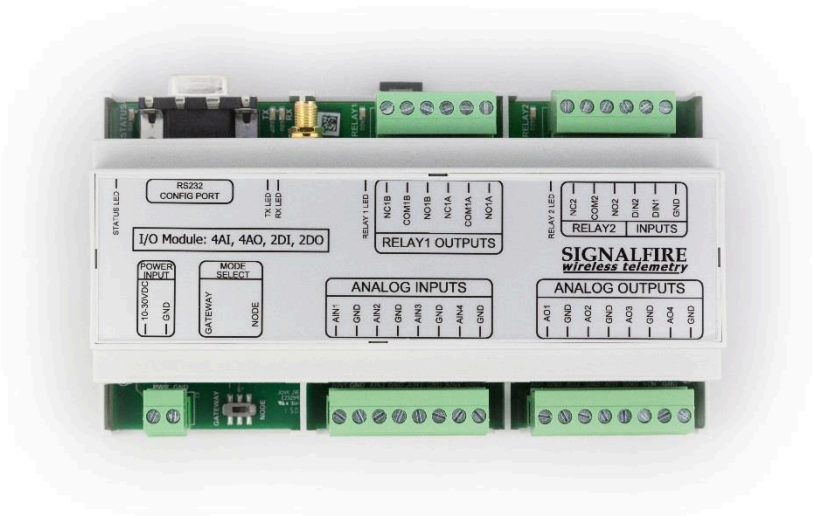
Interface Manual

Wireless I/O Node

SignalFire Number: Wireless-IO-IA
Wireless-IO-EXA



The SignalFire Wireless I/O Node has the following features:

- 4 Analog inputs (0-20mA or 0-5V)
- 4 Analog outputs (0-20mA or 0-5V)
- 2 Digital inputs (totalizers and frequency reporting, up to 2kHz)
- 2 Relay outputs (1 DPDT, 1 SPDT)
- Acts as a repeater for other SignalFire wireless devices
- Wide range DC power input. 10 to 30VDC
- Low power consumption
- DIN Rail Mount with pluggable screw terminal blocks
- Status LEDs

Specifications

Power	10-30 VDC (25mA average @12V no relays energized, additional 15mA max for each energized relay, plus any analog output current)
Operating Temp	-40°C to +80°C
Analog Inputs	0-10V Max, 0-24mA Max
Digital Inputs	Dry Contact or 30 Volts Max (push-pull), 2kHz maximum frequency
Radio Frequency	902-928MHz ISM Band, FHSS radio, SMA connector

Hazardous Location Certification

The Wireless IO Module is rated Class 1 Division 2 non-incendive.

WARNING: EXPLOSION HAZARD. DO NOT REMOVE OR REPLACE COMPONENTS UNLESS POWER HAS BEEN DISCONNECTED OR THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.

AVERTISSEMENT : RISQUE D'EXPLOSION . NE PAS RETIRER OU REMPLACER LES COMPOSANTS QUE L'ALIMENTATION EST DÉBRANCHÉ OU ZONE EST LIBRE DE CONCENTRATIONS IGNITIBLE.

WARNING – EXPLOSION HAZARD Substitution of components may impair suitability for Class I, Division 2

AVERTISSEMENT - RISQUE D'EXPLOSION. La substitution de composants peut rendre ce materiel inacceptable pour les emplacements de classe I, division 2

WARNING – EXPLOSION HAZARD Do not disconnect while circuit is live unless area is known to be nonhazardous

AVERTISSEMENT - RISQUE D'EXPLOSION. Ne débranchez pas lorsque le circuit est en direct , sauf si la zone est connue pour être nonhazardous

WARNING – The Wireless IO Module must be installed in a suitable enclosure for intended environment

AVERTISSEMENT - Le module IO sans fil doit être installé dans une enceinte appropriée pour l'environnement prévu

WARNING – All wring methods must be in accordance with the NEC

AVERTISSEMENT - Toutes les méthodes de Essorez doivent être en conformité avec la NEC

Connections and Components

The multi I/O node provides screw terminals for connections to the analog/digital inputs/outputs.

Power must be provided by the Power Input screw terminals (10-30VDC). The module power requirements at 12VDC is 25mA average plus 15mA per energized relay channel. Power required for any attached devices (analog inputs/outputs) is in addition to this.

The antenna port is standard SMA connector. Connect this port to a suitable 900MHz antenna.

Status LEDs

The Wireless I/O node has a green status LED which blinks indicating the module is running. The status LED also indicates the signal strength for its radio link. In addition there are TX/RX LEDs to indicate radio messages to/from the module.

The status LED will blink once a second if it is not connected to the network. If the node is connected to the network, it will blink a link quality code every 3 seconds.

3 Blinks	=	Strong Signal
2 Blinks	=	Good Signal
1 Blink	=	Weak Signal

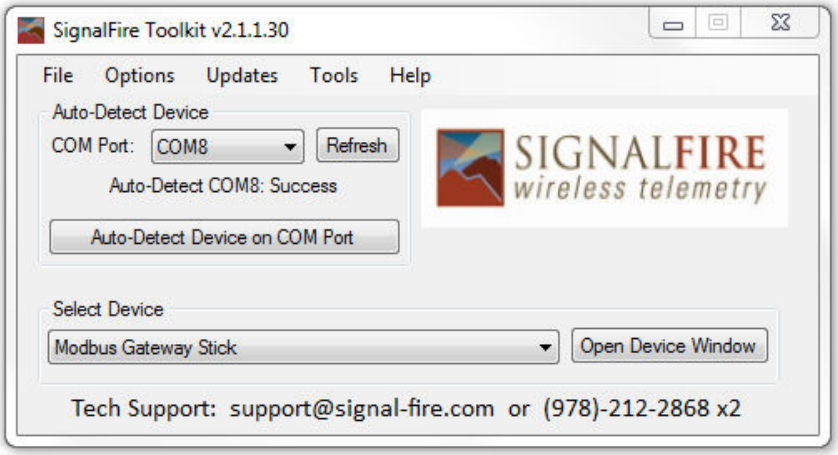
Each relay output also has a green LED which turns on while the relay is energized.

Configuration

To operate as a node on the SignalFire network the **Mode Select** slide switch must be switched to the **NODE** position. After changing the position of this switch the module must be power cycled for the change to take effect.

Using the SignalFire Toolkit

The SignalFire Toolkit application can be downloaded at www.signal-fire.com/customer. After installation, launch the software and the main toolkit window will open:



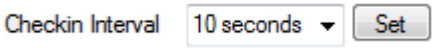
Select the COM port associated with the Field Monitor and click "Auto-Detect Device on COM Port." This will open the device configuration window, where all device settings can be configured.

Network Setting

The network is set using the SignalFire Toolkit. The network, network group, and corporate ID settings must match those of all other nodes in the network in order for them to communicate (the corporate ID is pre-programmed at factory).

System Check-in Period

This setting controls how often the input data will be forwarded to the gateway, and is configured using the SignalFire Toolkit.



Analog Inputs

The four analog inputs (AIN1-AIN4) on the node will be read and forwarded to the gateway at each check-in interval.

Analog Outputs

The four analog outputs (AO1-AO4) on the node are controlled via Modbus write commands from the master Modbus device connected to the gateway. Note that the analog outputs are always written in µA even when the switch is set for a 1-5V output. It is up to the PLC to convert the readings to voltage. Voltage output to µA simply multiply by 4000, for example for a 3V output write a value of 12000.

Digital Inputs

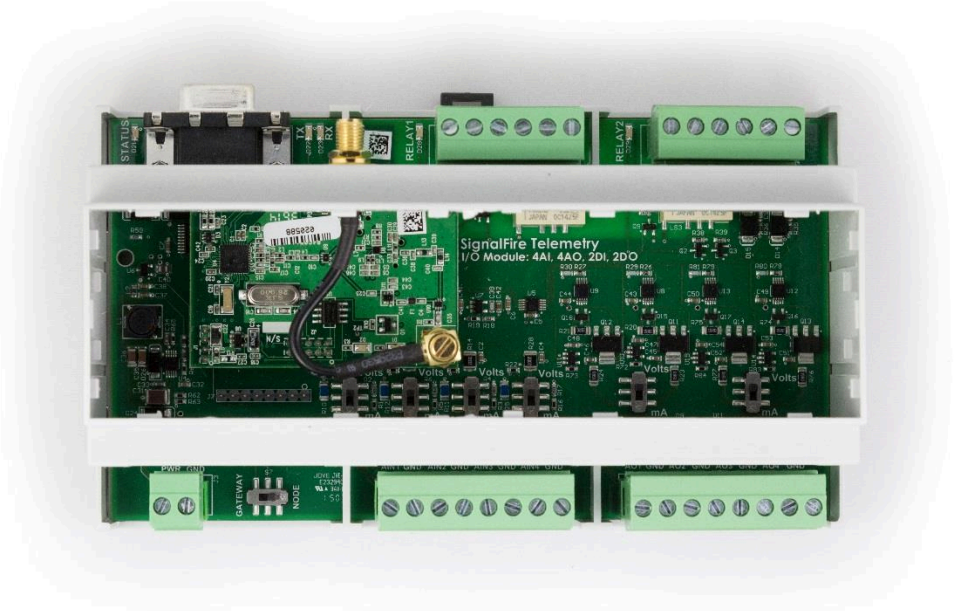
The two digital inputs are read and forwarded to the gateway at each check-in interval. In addition if **State Change Check-in** is enabled, all readings (analog and digital) will be sent to the gateway immediately. Do not enable the state change check-in for rapidly changing inputs. Each input is also totalized and the frequency is also reported.

Relay Outputs

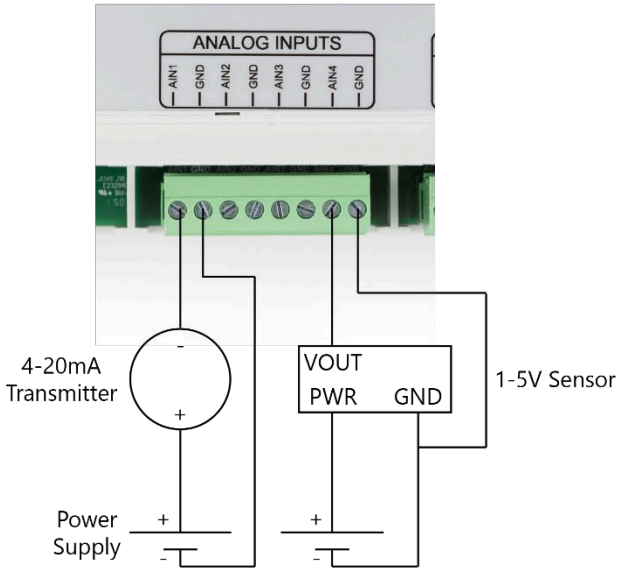
The two digital outputs are relays with one of them being SPDT and one being DPDT. The state of the relays is controlled via Modbus write commands from the master Modbus device connected to the gateway. Alternatively the relays can be controlled using the RSD settings in the SignalFire Gateway.

Analog Inputs

The analog inputs may operate in either current (0-20mA/4-20mA), or voltage (0-5V/1-5V). The input mode must be set by slide switches inside the module. Slide the switch corresponding to the input channel up to **Volts** for a voltage input, or down to **mA** for a current input. To do this first remove the cover using a small flathead screwdriver, the cover is held on by clips.



Wire the analog voltage or current to the set of screw terminals. Maximum input voltage (for either current or voltage input mode) is 10 Volts. The compliance voltage for a 4-20mA device must be provided externally. See wiring diagram for details.



Analog Inputs Example Wiring Diagram

An example of a 4-20mA transmitter connected to AIN1 and a 1-5V sensor connected to AIN4 is shown above. Note that generally the same power supply being used to power the node would be used to provide power for the attached sensors.

Analog Outputs

Each switch controls the output mode for a pair of outputs. For example the switch on the left sets both output 1 and output 2 to either mA or Volts. Slide the switch up for a voltage output or down for a mA output. In mA output mode the compliance voltage will be the node supply voltage.

Digital Inputs

The digital inputs (2 total) can be dry contact or voltage (must be push-pull, 30 Volts max). Be sure to connect the ground bus from the module to either the ground of the voltage device or the dry contact.

Digital (Relay) Outputs

There are two relay outputs. Relay 1 is DPDT and relay 2 is a SPDT relay. The relays are rated for the following:

30 VDC @ 2 Amps
250 VAC @ 0.25 Amps

Failsafe Operations

In the event of a loss of communication between the node and the gateway, it may be desirable for the outputs to go to a fail state. This is accomplished by setting one or both of the failsafe timers.

Communication Failsafe Timer – If the node losses its wireless communications link to the gateway for greater than this time, any failsafe enabled relay will be put into a non-energized state. The relay will remain in this "safe" state until a Modbus command is sent to the gateway to energize the coil. In addition any failsafe enabled analog output will be set to its configured fail value until a new value is written from the PLC.

Message Failsafe Timer – This is similar to the previous timer, but this indicates the time since a valid Modbus coil write message or analog output write has been sent from the Modbus master through the SignalFire Gateway. If used this must be set higher than the Modbus coil write and analog output write frequency of the Modbus master device.

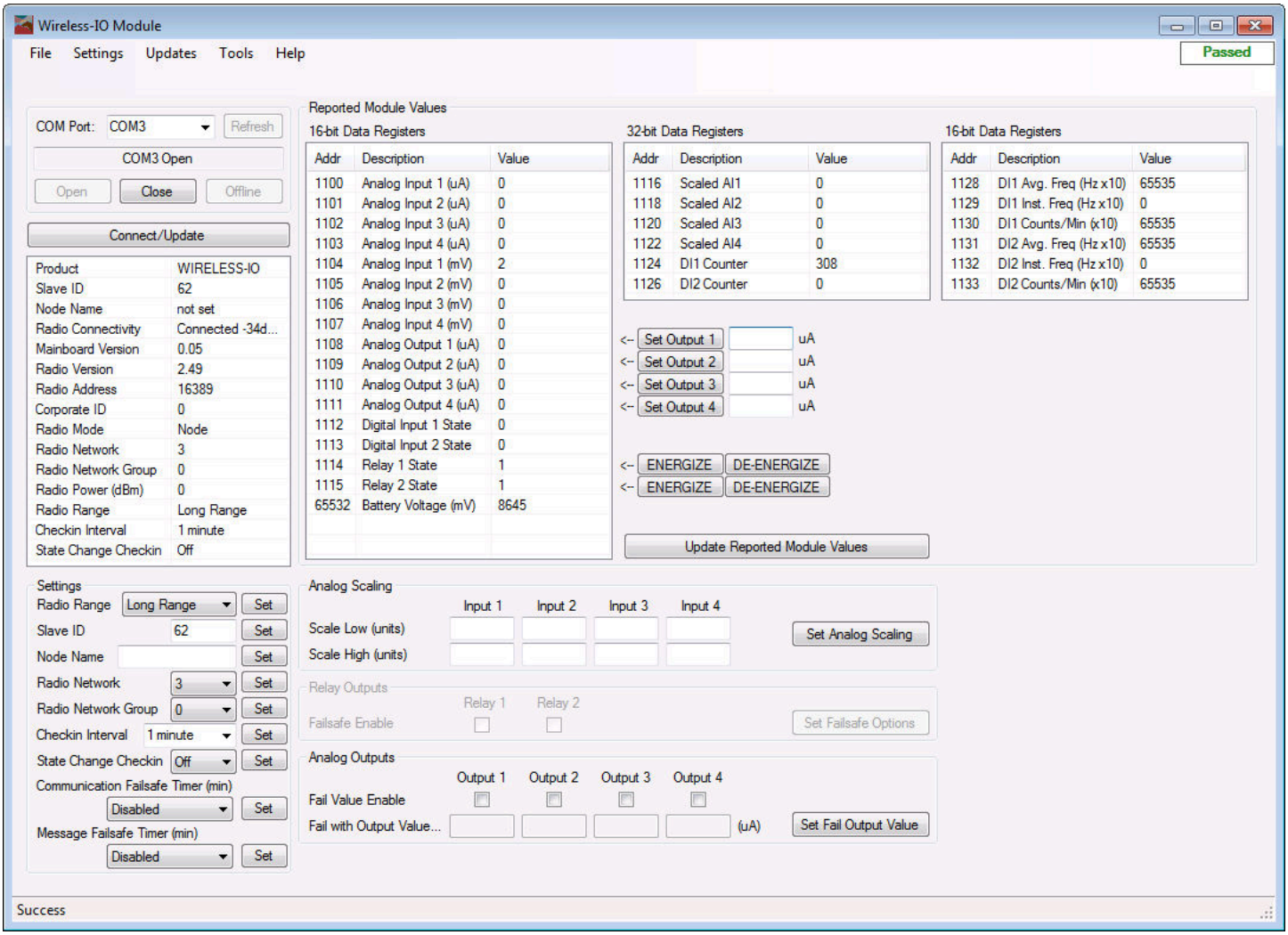
Any analog output with a fail value enabled will go to the fail value at boot, any analog output without a fail value will go to 0 at boot.

Analog Scaling

Analog scaling can be used to scale an analog input to engineering units. For example, for a 0-1000psi sensor set the scale low to 0 and scale high to 1000. The scaled value will now be displayed in the Toolkit and reported to the gateway as a floating point number.

Digital Input Debounce

In cases where it is desired to accurately totalize digital input counts it may be necessary to enable the digital input debounce timer. The debounce timer is useful when dealing with dry contacts that may otherwise produce extra count when they close. To enable the digital debounce select **Digital Input Debounce** from the settings pull-down menu. A typical value for a dry contact would be 100mS. Any extra counts due to contact bounce within the debounce time setting will be ignored.


Wireless-IO Module
File
Settings
Updates
Tools
Help
Passed
COM Port: COM3
Refresh
COM3 Open
Open
Close
Offline
Connect/Update
Product WIRELESS-IO
Slave ID 62
Node Name not set
Radio Connectivity Connected -34d...
Mainboard Version 0.05
Radio Version 2.49
Radio Address 16389
Corporate ID 0
Radio Mode Node
Radio Network 3
Radio Network Group 0
Radio Power (dBm) 0
Radio Range Long Range
Checkin Interval 1 minute
State Change Checkin Off
Reported Module Values
16-bit Data Registers
Addr Description Value
1100 Analog Input 1 (uA) 0
1101 Analog Input 2 (uA) 0
1102 Analog Input 3 (uA) 0
1103 Analog Input 4 (uA) 0
1104 Analog Input 1 (mV) 2
1105 Analog Input 2 (mV) 0
1106 Analog Input 3 (mV) 0
1107 Analog Input 4 (mV) 0
1108 Analog Output 1 (uA) 0
1109 Analog Output 2 (uA) 0
1110 Analog Output 3 (uA) 0
1111 Analog Output 4 (uA) 0
1112 Digital Input 1 State 0
1113 Digital Input 2 State 0
1114 Relay 1 State 1
1115 Relay 2 State 1
65532 Battery Voltage (mV) 8645
32-bit Data Registers
Addr Description Value
1116 Scaled AI1 0
1118 Scaled AI2 0
1120 Scaled AI3 0
1122 Scaled AI4 0
1124 DI1 Counter 308
1126 DI2 Counter 0
16-bit Data Registers
Addr Description Value
1128 DI1 Avg. Freq (Hz x10) 65535
1129 DI1 Inst. Freq (Hz x10) 0
1130 DI1 Counts/Min (x10) 65535
1131 DI2 Avg. Freq (Hz x10) 65535
1132 DI2 Inst. Freq (Hz x10) 0
1133 DI2 Counts/Min (x10) 65535
<-- Set Output 1 uA
<-- Set Output 2 uA
<-- Set Output 3 uA
<-- Set Output 4 uA
<-- ENERGIZE DE-ENERGIZE
<-- ENERGIZE DE-ENERGIZE
Update Reported Module Values
Settings
Radio Range Long Range Set
Slave ID 62 Set
Node Name Set
Radio Network 3 Set
Radio Network Group 0 Set
Checkin Interval 1 minute Set
State Change Checkin Off Set
Communication Failsafe Timer (min)
Disabled Set
Message Failsafe Timer (min)
Disabled Set
Analog Scaling
Input 1 Input 2 Input 3 Input 4
Scale Low (units)
Scale High (units)
Set Analog Scaling
Relay Outputs
Relay 1 Relay 2
Failsafe Enable
Set Failsafe Options
Analog Outputs
Output 1 Output 2 Output 3 Output 4
Fail Value Enable
Fail with Output Value... (uA)
Set Fail Output Value
Success

Register Address	Register Number	Description	Function Code	Register Type
Coils (0xxxx)				
Write-only				
101	00102	Relay1 Coil	05,	Write Only
102	00103	Relay2 Coil	05,	Write Only
111	00112	Counter1 Reset Coil	05,	Write Only
112	00113	Counter2 Reset Coil	05,	Write Only
Holding Registers (4xxxx)				
121	40122	Relay1 Pulse (0 = Off, 1 – 255 = Pulse Time (sec))	06,	Write Only
122	40123	Relay2 Pulse	06,	Write Only
1100	41101	AI1: Current Reading (Unsigned int, µA)	03, 04	Read Only
1101	41102	AI2: Current Reading	03, 04	Read Only
1102	41103	AI3: Current Reading	03, 04	Read Only
1103	41104	AI4: Current Reading	03, 04	Read Only
1104	41105	AI1: Voltage Reading (Unsigned int, mV)	03, 04	Read Only
1105	41106	AI2: Voltage Reading	03, 04	Read Only
1106	41107	AI3: Voltage Reading	03, 04	Read Only
1107	41108	AI4: Voltage Reading	03, 04	Read Only
1108	41109	AO1: Current Output (Unsigned in, µA)	03, 04, 06	Read/Write
1109	41110	AO2: Current Output	03, 04, 06	Read/Write
1110	41111	AO3: Current Output	03, 04, 06	Read/Write
1111	41112	AO4: Current Output	03, 04, 06	Read/Write
1112	41113	DI1: State (Unsigned int, 1 = Closed or 0 = Open)	03, 04	Read Only
1113	41114	DI2: State	03, 04	Read Only
1114	41115	Relay #1 State (Unsigned int, 1 = ON or 0 = OFF)	03, 04	Read Only
1115	41116	Relay #2 State	03, 04	Read Only
1116	41117	AI1: Scaled Reading (Float High Word)	03, 04	Read Only
1117	41118	AI1: Scaled Reading (Float Low, Word)	03, 04	Read Only
1118	41119	AI2: Scaled Reading	03, 04	Read Only
1119	41120	AI2: Scaled Reading	03, 04	Read Only
1120	41121	AI3: Scaled Reading	03, 04	Read Only
1121	41122	AI3: Scaled Reading	03, 04	Read Only
1122	41123	AI4: Scaled Reading	03, 04	Read Only
1123	41124	AI4: Scaled Reading	03, 04	Read Only
1124	41125	DI1: Total Counts (Unsigned int, High Word)	03, 04	Read Only
1125	41126	DI1: Total Counts (Unsigned int, Low Word)	03, 04	Read Only
1126	41127	DI2: Total Counts (Unsigned int, High Word)	03, 04	Read Only
1127	41128	DI2: Total Counts (Unsigned int, Low Word)	03, 04	Read Only
1128	41129	DI1: Average Frequency (Hz x 10)	03, 04	Read Only
1129	41130	DI1: Instantaneous Frequency (Hz x 10)	03, 04	Read Only
1130	41131	DI1: Counts per minute (x 10)	03, 04	Read Only
1131	41132	DI2: Average Frequency (Hz x 10)	03, 04	Read Only
1132	41133	DI2: Instantaneous Frequency (Hz x 10)	03, 04	Read Only
1133	41134	DI1: Counts per minute (x 10)	03, 04	Read Only

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Revision History

Revision	Date	Changes/Updates
1.0	1/22/15	Initial release
1.3	6/26/15	Updated Design
1.4	4/4/16	Added detail for C1D1 certification