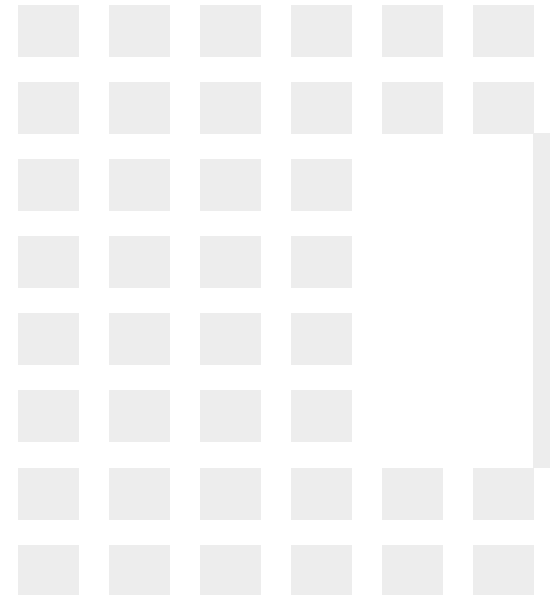




Think Automation and beyond...

CONFIDENTIAL

How to Connect the FC6A Plus to Ignition Using Sparkplug B



Configuration



- This tutorial explains how to connect the FC6A to Ignition.
- Refer the following configuration of the FC6A and Ignition.



MQTT Sparkplug B



- IP Address: 192.168.1.50
- Client ID: MAC Address
- Account name: username
- Password: password
- Group name: idec
- Node name: fc6a
- Device name: sensor_1

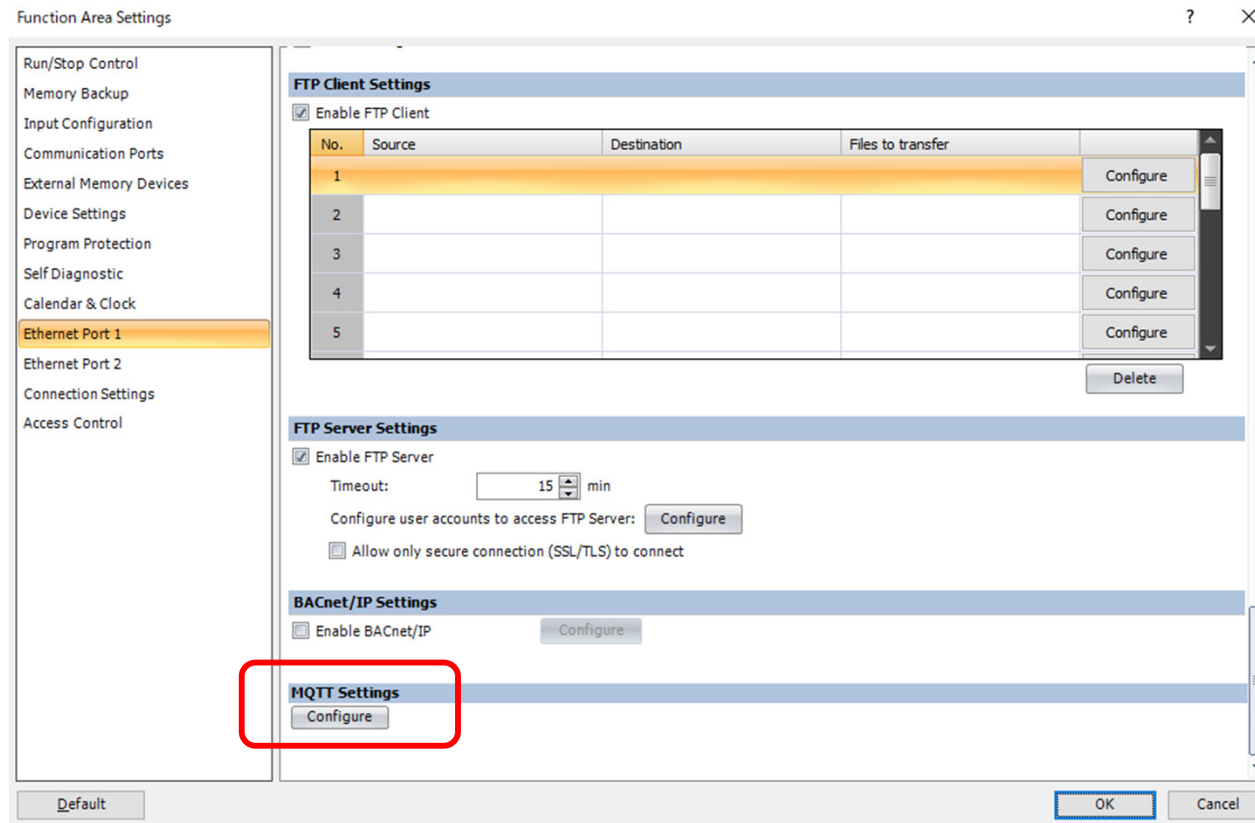
- IP Address: 192.168.1.103
- MQTT port: 1883

- WindLDR
 1. Configure the communication settings
 2. Configure the Node/Device Metrics
 3. Download the program
 4. Run the program

Communication settings



■ Open “MQTT settings”



Communication settings



- Check “Enable MQTT Client function” check box.
- Select “Sparkplug B” in “Connect to” list box.

The screenshot displays the 'MQTT Settings' configuration window. At the top, the title 'MQTT Settings' is visible. Below the title, there is a section with two main elements: a checked checkbox labeled 'Enable MQTT Client function' and a dropdown menu labeled 'Connect to:'. The dropdown menu currently shows 'SparkPlug B' as the selected option. Below these elements, there are two tabs: 'SparkPlug B Settings' (which is highlighted in yellow) and 'SparkPlug B Basic Settings' (which is highlighted in blue). Under the 'SparkPlug B Basic Settings' tab, there is a checkbox labeled 'Specify with SD memory card' which is currently unchecked.

Communication settings



- Enter the host name or IP address of Ignition server.

SparkPlug B Basic Settings

Specify with SD memory card

Broker

Host Name:

IP Address:

Port Number:

Keep Alive: sec

Client ID:

MAC Address:

Fixed value:

Data Register: ... (-)

Communication settings



- Check “Authentication is required to connect to Broker”.
- Enter the account name(user name) and password.

Authentication is required to connect to Broker

Account Name:

Password:

Communication settings



- Enter “Group” name
- Enter “Edge Node” name

Group:

Fixed value:

Data Register: ... (-)

Edge Node:

MAC Address:

Fixed value:

Data Register: ... (-)

Communication settings



- Enter “Connection Control” device and “Connection Status” device.
- In this example, “M0” is assigned to “Connection Control” and “D0” is assigned to “Connection Status”.(Connection Control device is used in Ladder Program”)

Edge Node Device

Connection Control:	<input type="text" value="M0000"/>	...	
Connection Status:	<input type="text" value="D0000"/>	...	(D0000 - D0008)

Device and Metrics settings



- Move to “Device & Tag Settings” tab

The screenshot shows the 'SparkPlug B Settings' interface. The 'Device & Tag Settings' tab is selected and highlighted with a red box. Below the tab, there is a 'Use Alias' checkbox which is checked. A table displays the configuration for the device 'fc6atest2'.

Edge Node	Device	Metrics	Online Control	Auto ON	Status	Occupied device address
fc6atest2		Configure	M0000			...
		Configure		...	<input checked="" type="checkbox"/>	...

Device and Metrics settings



- Enter “Status” device.
- In this example, “M100” is assigned.

Device & Tag Settings

Use Alias

Edge Node	Device	Metrics	Online Control	Auto ON	Status	Occupied device address
fc6gatest2		Configure	M0000		M0100	...
		Configure		...	<input checked="" type="checkbox"/>	...

Device and Metrics settings



- Click “Configure” button under “Metrics” column.
- “Metrics” dialog box is opened.
- To create a new Metric, Click “New Metrics” button.

Device & Tag Settings

Use Alias

Edge Node	Device	Metrics	Online Control	Auto ON	Status	Occupied device address	
fc6atest2		Configure	M0000		M0100	...	M0000
		Configure		...	<input checked="" type="checkbox"/>	...	

Metrics

ID	Name	Format	Data Type	Value
1	(root)	Folder (0)		

Size: 86 bytes (32768 bytes max.)
Number of IDs: 1 (800 max.)
Depth: 1 (10 max.)

Minimum Monitoring Cycle: 500 ms
 Write Current Monitoring Cycle: ...

Transmission Delay Cycle: 500 ms

New Folder **New Metric** Edit Delete

Up Down

Import JSON Text Export JSON Text OK Cancel

Device and Metrics settings



- Configure the Metric parameters.
- In this example, the following parameters are configured.
 - Name: “Metric”(Default)
 - Data Type: Word(W)
 - Value: “Device”, Enter “D1000”

The screenshot shows a 'New Metric' dialog box with the following configuration:

- Name: Metric
- Data Type: Word (W)
- Value: Device (selected), with a text input field containing 'D1000' and a button to open a selection dialog.
- Write: Allow
- Turn on is_transient flag:

Buttons for 'OK' and 'Cancel' are visible at the bottom right.

Device and Metrics settings



- Configure the other metrics.
- In this example, the following metrics are configured.

The screenshot shows a window titled 'Metrics' with a table containing four rows of data. The table has columns for ID, Name, Format, Data Type, and Value. The first row is highlighted in blue. A red border is drawn around the table area.

ID	Name	Format	Data Type	Value
1	■ (root)	Folder (3)		
2	┆ Metric	Metric	Word (W)	D1000
3	┆ Metric2	Metric	String (S)	fixed_text
4	┆ Metric3	Metric	Float (F)	123.456

Device and Metrics settings



- To add “Device” as SparkPlug-B, Enter Device name into the 2nd row.
- And then Enter “Online Control” device, “Status” device and “Metrics”.

Device & Tag Settings

Use Alias

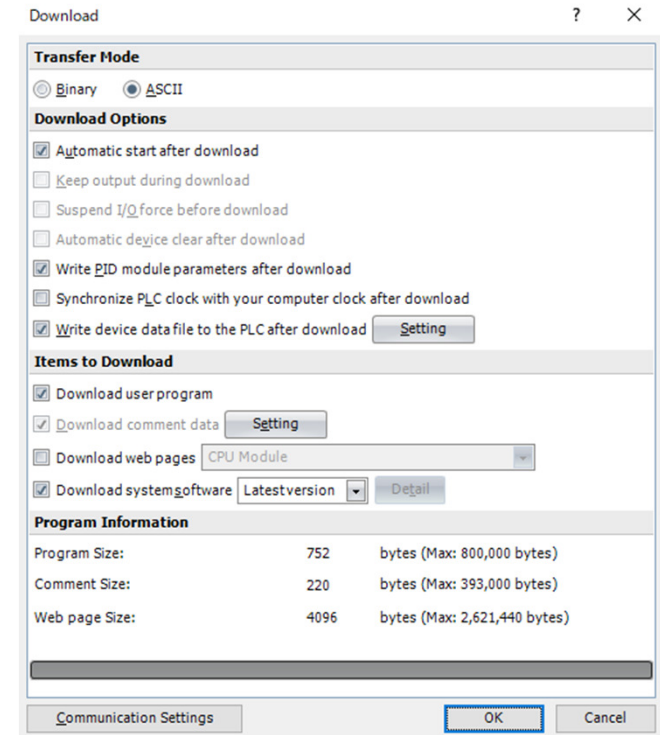


Edge Node	Device	Metrics	Online Control		Auto ON	Status	Occupied device address
fc6a		Configure				D0100	D0100 - D0107
	sensor_1	Configure	M0200	...	<input checked="" type="checkbox"/>	D0200	M0200, D0200 - D0207
		Configure		...	<input checked="" type="checkbox"/>		...

Download the project



- Click “OK” to close the MQTT dialog box.
- Download the WindLDR project to the FC6A



How to start the connection from the
FC6A to Ignition?

How to run the program



- Start Monitor and Set(Turn ON) “Connection Control” device in MQTT setting.
 - In this example, the device is “M0”.
- If the FC6A can connect the Ignition, the value of “Connection Status” device is changed to “4”. If the value is “16”, the connection was failed.(Check the value of “Connection Status” device +1.)
 - In this example, if D0 value is changed to “4”, the communication works fine, but if it is “16”, check D1 value.(Refer the next page for the error No.)

Edge Node Device

Connection Control:	<input type="text" value="M0000"/>	...
Connection Status:	<input type="text" value="D0000"/>	...

(D0000 - D0008)

How to run the program



Storage Destination	Item	Description																																
Starting number+0	Connection Status	Stores the status when connecting to the broker.																																
		<table border="1"> <thead> <tr> <th>Status Code</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>0 (0000h)</td> <td>Initial status (disconnected)</td> </tr> <tr> <td>2 (0002h)</td> <td>Connecting</td> </tr> <tr> <td>4 (0004h)</td> <td>Connected</td> </tr> <tr> <td>8 (0008h)</td> <td>Disconnecting</td> </tr> <tr> <td>16 (0010h)</td> <td>Connection processing error</td> </tr> <tr> <td>32 (0020h)</td> <td>Disconnection processing error</td> </tr> </tbody> </table>	Status Code	Status	0 (0000h)	Initial status (disconnected)	2 (0002h)	Connecting	4 (0004h)	Connected	8 (0008h)	Disconnecting	16 (0010h)	Connection processing error	32 (0020h)	Disconnection processing error																		
		Status Code	Status																															
		0 (0000h)	Initial status (disconnected)																															
		2 (0002h)	Connecting																															
		4 (0004h)	Connected																															
		8 (0008h)	Disconnecting																															
		16 (0010h)	Connection processing error																															
32 (0020h)	Disconnection processing error																																	
Starting number+1	Connection Error Code	Stores information about the error that occurred when connecting to the broker.																																
		<table border="1"> <thead> <tr> <th>Error Code</th> <th>Error Details</th> </tr> </thead> <tbody> <tr> <td>1 (0001h)</td> <td>The Ethernet cable is disconnected or broken and the Plus CPU module cannot connect to the network properly</td> </tr> <tr> <td>2 (0002h)</td> <td>Authentication information was not downloaded from the SD memory card or reading the downloaded authentication information failed</td> </tr> <tr> <td>4 (0004h)</td> <td>Invalid client ID format</td> </tr> <tr> <td>16 (0010h)</td> <td>An unknown packet was received</td> </tr> <tr> <td>32 (0020h)</td> <td>An invalid MQTT packet was received</td> </tr> <tr> <td>64 (0040h)</td> <td>Keep alive timeout error</td> </tr> <tr> <td>80 (0050h)</td> <td>Packet could not arrive at destination host</td> </tr> <tr> <td>96 (0060h)</td> <td>MQTT packet receive timeout error</td> </tr> <tr> <td>112 (0070h)</td> <td>TLS error</td> </tr> <tr> <td>256 (0100h)</td> <td>Broker connection refused (unacceptable MQTT protocol version)</td> </tr> <tr> <td>512 (0200h)</td> <td>Broker connection refused (invalid client ID)</td> </tr> <tr> <td>768 (0300h)</td> <td>Broker connection refused (broker unavailable)</td> </tr> <tr> <td>1024 (0400h)</td> <td>Broker connection refused (invalid account name or password)</td> </tr> <tr> <td>1280 (0500h)</td> <td>Broker connection refused (not authorized)</td> </tr> <tr> <td>32768 (8000h)</td> <td>Broker response error</td> </tr> </tbody> </table>	Error Code	Error Details	1 (0001h)	The Ethernet cable is disconnected or broken and the Plus CPU module cannot connect to the network properly	2 (0002h)	Authentication information was not downloaded from the SD memory card or reading the downloaded authentication information failed	4 (0004h)	Invalid client ID format	16 (0010h)	An unknown packet was received	32 (0020h)	An invalid MQTT packet was received	64 (0040h)	Keep alive timeout error	80 (0050h)	Packet could not arrive at destination host	96 (0060h)	MQTT packet receive timeout error	112 (0070h)	TLS error	256 (0100h)	Broker connection refused (unacceptable MQTT protocol version)	512 (0200h)	Broker connection refused (invalid client ID)	768 (0300h)	Broker connection refused (broker unavailable)	1024 (0400h)	Broker connection refused (invalid account name or password)	1280 (0500h)	Broker connection refused (not authorized)	32768 (8000h)	Broker response error
		Error Code	Error Details																															
		1 (0001h)	The Ethernet cable is disconnected or broken and the Plus CPU module cannot connect to the network properly																															
		2 (0002h)	Authentication information was not downloaded from the SD memory card or reading the downloaded authentication information failed																															
		4 (0004h)	Invalid client ID format																															
		16 (0010h)	An unknown packet was received																															
		32 (0020h)	An invalid MQTT packet was received																															
		64 (0040h)	Keep alive timeout error																															
		80 (0050h)	Packet could not arrive at destination host																															
		96 (0060h)	MQTT packet receive timeout error																															
		112 (0070h)	TLS error																															
		256 (0100h)	Broker connection refused (unacceptable MQTT protocol version)																															
		512 (0200h)	Broker connection refused (invalid client ID)																															
		768 (0300h)	Broker connection refused (broker unavailable)																															
		1024 (0400h)	Broker connection refused (invalid account name or password)																															
1280 (0500h)	Broker connection refused (not authorized)																																	
32768 (8000h)	Broker response error																																	

Sample Program

Sample Program



- If you download the sample program, “Connection Control” device is automatically turned ON.
- D1000 and D1001 are periodically increased.

The screenshot displays the Ignition Designer interface. The top window shows a ladder logic program with several rungs. Rung 6 is labeled 'In-operation Output' and contains a timer TML T0000 with a value of 5. Rung 7 contains a timer TML T0001 with a value of 60. The bottom window shows a data table with the following columns: Device, Device Address, Monitor Type, Device Range, Current Value, Preset Value, and Comment.

Device	Device Address	Monitor Type	Device Range	Current Value	Preset Value	Comment
M0121	M0121	BDN (B)	0	1		1← Clock
M0000	M0000	DEC (W)	0	0		
D0000	D0000	DEC (W)	0	0		
D1000	D1000	DEC (W)	0	31		Metric in Node
D1001	D1001	DEC (W)	0	40		Device 1 Metric in device_1
D1002	D1002	DEC (W)	0	50		Device 1 Metric2 in device_1
M0200	M0200	DEC (W)	0	1		
D0100	D0100	DEC (W)	0	0		
D0101	D0101	DEC (W)	0	0		
D0102	D0102	DEC (W)	0	0		
D0200	D0200	DEC (W)	0	0		
D0201	D0201	DEC (W)	0	0		
D0202	D0202	DEC (W)	0	0		

Demo



The screenshot displays the Ignition Designer interface. The top window shows a ladder logic diagram with three rungs. Rung 6 is highlighted, showing a normally open contact labeled 'M0' connected to a coil labeled 'M000'. Rung 7 shows a normally open contact labeled 'M000' connected to a coil labeled 'M000'. The bottom window shows a data table with the following columns: Device, Device Address, Monitor Type, Device Range, Current Value, Preset Value, and Comment.

Device	Device Address	Monitor Type	Device Range	Current Value	Preset Value	Comment
M8121	M8121	BIN (B)	0	1		1-s Clock
M0000	M0000	DEC (W)	0	1		
D0000	D0000	DEC (W)	0	0		
D1000	D1000	DEC (W)	0	24		Metric in Node
D1001	D1001	DEC (W)	0	24		Device 1 Metric in device_1
D1002	D1002	DEC (W)	0	78		Device 1 Metric2 in device_1
M0200	M0200	DEC (W)	0	1		
D0100	D0100	DEC (W)	0	0		
D0101	D0101	DEC (W)	0	0		
D0102	D0102	DEC (W)	0	0		
D0200	D0200	DEC (W)	0	0		
D0201	D0201	DEC (W)	0	0		
D0202	D0202	DEC (W)	0	0		

Steps:

1. Enable “allow write from Ignition”
2. Enable “Preview” mode in Ignition Designer
3. Start PLC on WindLDR
4. After 5sec, “M0”(Connection Control Bit) is turned ON
5. After M0 is turned ON, Red rectangles in Ignition are changed to White.(This means the FC6A is connected successfully, and data is updated.)
6. The value in Custom monitor of WindLDR and Ignition are updated simultaneously.(D1000 and D1001 are updated every sec).
7. When changing the value of “Device 1 Metric2” using the slider at the bottom, D1002 value on the custom monitor is changed.

END