CONDSTAR

XT5000

Industrial Internet of Things (IIoT)

User Manual

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1. Description

XT5000 is Industrial Internet of Things (IIoT), it is cellular IIoT. XT5000 can communicate over several cellular networks 5G, 4G and 3G LTE networks worldwide with cellular IoT connectivity of Hologram. The cellular modem in XT5000 scans automatically all the available Bands and connect to the fastest cellular network. The XT5000 is programmed to work as Modbus master in order to send and receive messages with Hologram Cloud server through the connection to a TCP/IP server of the Cloud. The messages that are used at the communication are text string format and they include different data related to connected machines, sensors and slave devices. These messages can be written and read in the Hologram Cloud server to manage XT5000. The normal operation process of the XT5000 can be seen in the figure 1-1 below.

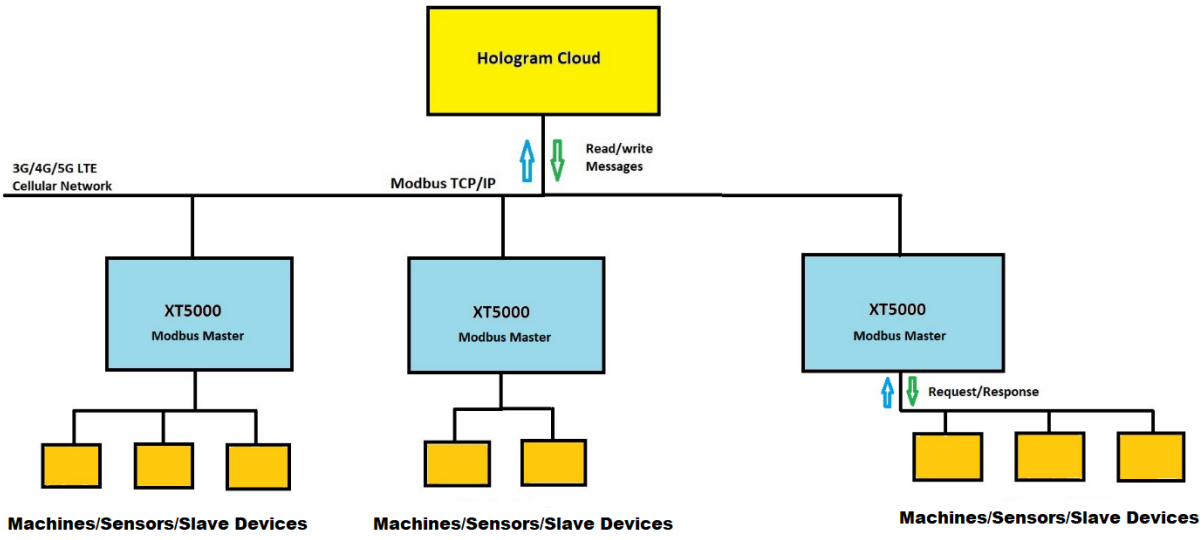


Figure 1-1. Operation process of XT5000

The Hologram Cloud server used cellular networks to communicate with XT5000 in order to monitor and control and exchange data collection of machines, sensors and slave devices. XT5000 has 3 isolated IO interface ports that can be connected to machines, sensors and slave devices. These ports are protected for overvoltage. The

isolated IO interface ports consist of Digital input, Digital output, Analog to Digital Converter (Precision ADC), SPI Communications, and DC voltage rail for different power applications. The isolated IO interface ports can provide high voltage protection and isolating for IO interface connection for different ground potentials to prevent risk of damage to devices and minimize noise coupling and prevent ground loops.

Additionally, there are two timers in the device XT5000 that can be enabled for managing ADC and SPI Communications. These timers can set the time for when XT5000 sends messages to the Hologram Cloud, and these messages are related with data monitoring of the Analog to digital converter (ADC) and SPI communications. Furthermore, the device XT5000 is ready programmed to be set to monitor the Digital input ports the whole time and send a message automatically to the Hologram Cloud when the status of the Digital input port is changed logically. All these setting for the timers and the monitor status of the Digital input port can be set and removed remotely by sending messages from the Hologram Cloud to the device XT5000. Besides the timers setting and the monitor setting of the Digital input port, XT5000 can also be set to send data messages continuously to the Hologram Cloud for both Analog to digital converter and SPI communications.

It can create a free account in the Hologram Cloud server to make communications with XT5000 device for sending and receiving the messages. More details on the messages can be found in document "**XT5000 Cloud Communications**" after finishing learning on XT5000 in this **document**.

There is DC voltage rail in the XT5000 which is +3.3V and it is isolated output source and they can be used for different external circuit applications. Especially when you connect SPI Slave device with the XT5000 and you need supply power source 3.3V for the SPI Slave device.

This **document** includes a guide on how to set the XT5000 to work at first time and make it ready for normal operation and to make connections with IO interface ports A, B and C. This **document** includes also hardware descriptions of XT5000 and how to connect external devices with the isolated IO interface ports of XT5000. We recommend users with technical background to implement the connections of external devices with XT5000.

There are also two other documents "**XT5000 Data Sheet"** and "**XT5000 Cloud Communications"** that you need to use them at the normal operation of the XT5000 but you should start here with this **document** first.

Table of Contents

2. Overview of XT5000

1. There are 4 LEDs in XT5000 device. They provide different indication for the device status. Refer to the table 2-1 below for the LEDs function and state.

LED Function	LED Name	Color State (Green)
XT5000 device is connected to cellular network	LED1	ON
Cellular modem in XT5000 is powered ON	LED2	ON
XT5000 device is powered ON	LED3	ON
XT5000 self-configuring is finished after restart or power up	LED4	ON

Table 2-1. LEDs Function and state

2. There is a Reset button and by pressing Reset button, the XT5000 device can be restarted.
3. There is an RF SMA connector for connecting Cellular Antenna with XT5000 device that works on 5G, 4G and 3G LTE cellular networks. There will be delivered Cellular Antenna with XT5000.
4. There is a SIM card connecter to insert Nano SIM card that works on 5G, 4G and 3G LTE Mobil networks. This connector is Push-Push type.
5. There are 3 isolated IO interface ports A, B and C. There will be delivered 3 Pluggable Terminal Blocks component to be connected to the connecters of the ports in XT5000 device, refer to **Appendix A** here for interface connection methods with the isolated IO interface ports.
6. There is power connector receptacle (USB type-C connector) for powering up of XT5000. USB-C cable will be delivered with XT5000 for powering up through USB-C connector. For users in vehicles, it can also power up of XT5000 in vehicle by the USB-C cable.

Furthermore, the figure 2-1. illustrates the main parts of the XT5000 for connectors, LEDs and button.

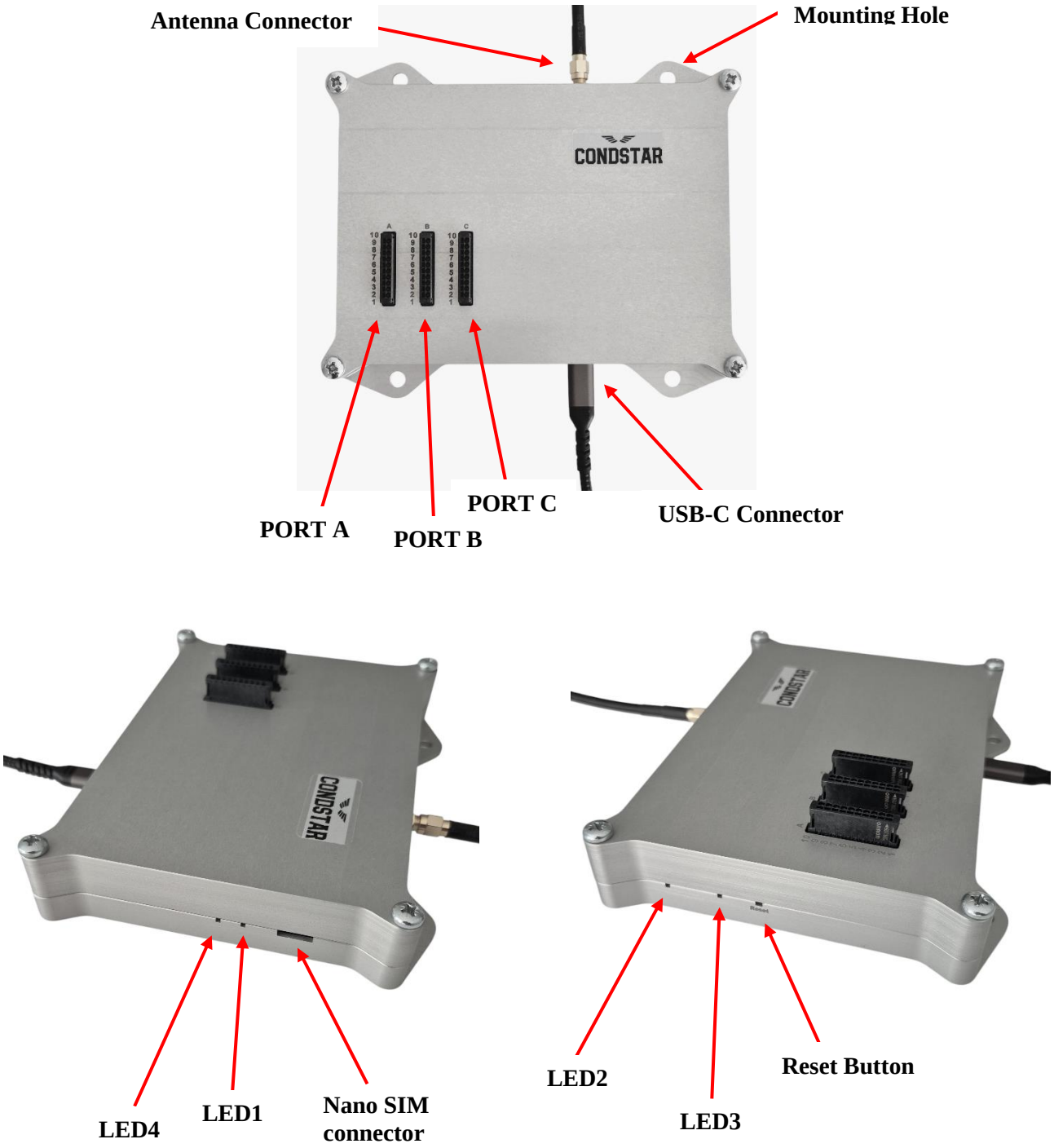


Figure 2-1. Overview of Cellular IIoT XT5000

3. Setup and Normal operation

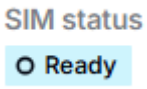
This section describes how to set up the XT5000 and make it ready for normal operation for the first time use of XT5000. After this setting up is finished, the XT5000 is ready for normal operation.

If the XT5000 device getting restarted or powered up later after first use, then the XT5000 device can configure its self and it will be another small setting up of XT5000 for normal operation and this setting up will be described below here.

3.1 Setting up XT5000 for first time use

1. Get HYPER IoT SIM Card for global cellular network from “Hologram.io” website.

2. Register and activate the SIM card for Global profile in Hologram Dashboard after creating free account there, refer to section 5 in References on how to do that. Make sure the registration of the SIM card for the XT5000 device is showed in Hologram Dashboard and then get the Device key that is related for this SIM card from Hologram Dashboard. Make sure that the state of the device in the Hologram Dashboard is getting blue color with the text “Ready” after finishing the registration of the SIM card like the picture here.
   That state means the SIM card for the XT5000 device is activated and ready for use on the Global Mobil network.



3. Insert the HYPER IoT SIM Card in the SIM holder in the XT5000 device.

4. Connect Antenna to the SMA connector using wrench SMA torque.

5. Power up the XT5000 device through USB type-C connector by using PD adapter out DC +5V, 3A. The LED2 and LED3 should be turned ON now.

6. The XT5000 will start up for configuration its self where this process takes 1-2 minutes. The LED4 in XT5000 device becomes ON after the self-configuration is finished. Furthermore, the SIM status of the device in Hologram Dashboard will be changed to “connected” and the LED1 will be turned ON. The LED1 is

turned ON when XT5000 device is currently connected to the Mobil Network. Make sure all the LEDs of LED1, LED2, LED3 and LED4 are turned ON before you proceed to next step (step 7).

7. Then restart the XT5000 device by switch it off and then ON by turn off & ON power to XT5000. Make sure all the LEDs of LED1, LED2, LED3 and LED4 are turned ON after restart before you proceed to next step (step 8).

8. Then go to Hologram Dashboard homepage in Hologram website and select the device SIM as shown in figure 3-1 and wait 1-2 minutes to receive the message that confirm the XT5000 device is registered. It can be seen the message by opening the drawer "All activity" at bottom of the Hologram Dashboard and then a new window will be opened for messages. This window shows all messages that are received and transmitted to the XT5000.

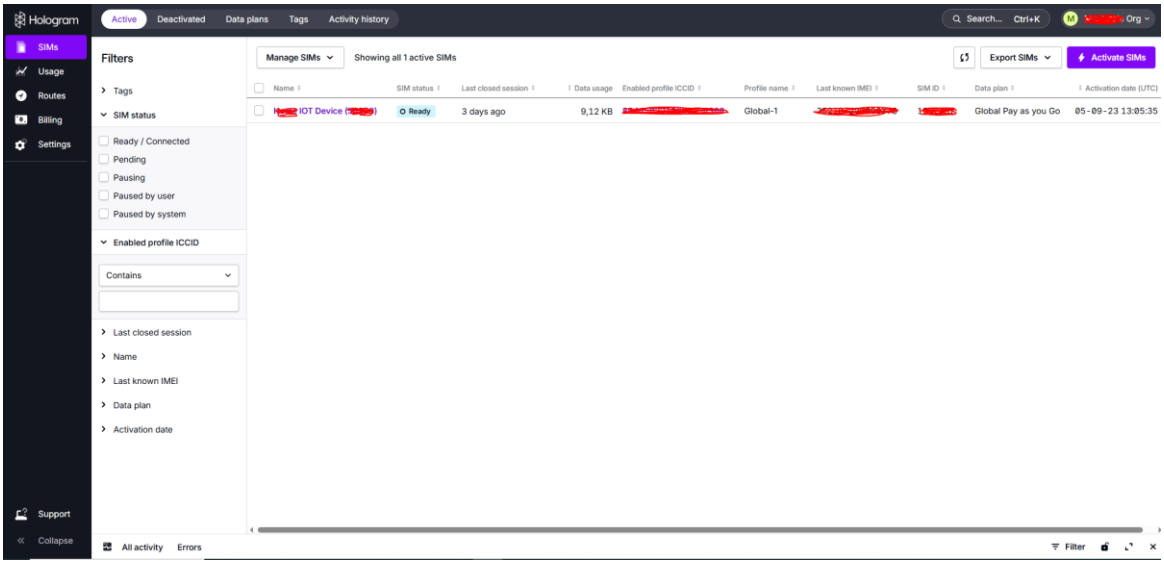
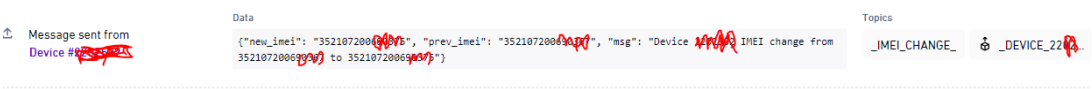


Figure 3-1. Hologram Dashboard homepage – XT5000 Device

9. Then you will get in Hologram Dashboard, the message that confirms XT5000 device is registered as the example in the picture below. Make sure all the LEDs of LED1, LED2, LED3 and LED4 are turned ON before you proceed to next step (step 10).



10. As soon as the LED4 becomes ON, the user should send a message that includes the SIM card device key to the XT5000 device. You may send messages to XT5000 from the device SIM page in the Hologram Dashboard. Select the device SIM in Hologram Dashboard and then click on “Manage SIMs” and select from the list “Send Message to SIM”. New window will be opened, make sure to select Cloud data in the new window and with Protocol “TCP” as shown in figure 3-2. Regarding the port, type the number “4010” and for the Data, type “D_K:xxxxxxxx”, where the x characters are just example for the device key that you will get it from Hologram Dashboard. Then wait few seconds and when you click on “Send message”, the Hologram Cloud will forward the message to the XT5000 device. The SIM card device key can be found by going into Webhooks tab inside the device SIM page.

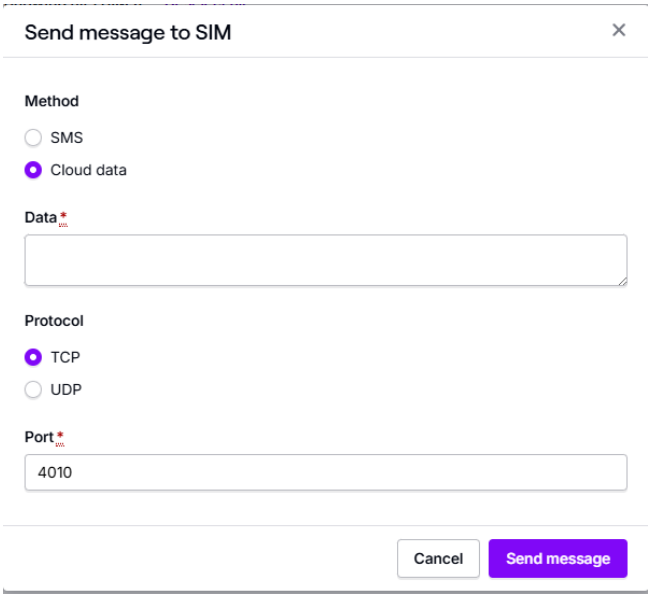
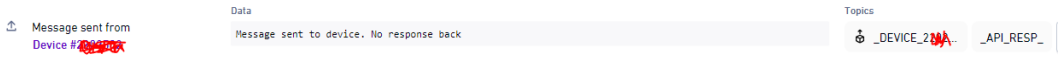


Figure 3-2. Messaging window for Device – Hologram Dashboard

11. Then wait 20 seconds and in the window “All activity” in the Hologram Dashboard, you will receive the response of the sent message “D_K:xxxxxxxx” which is “{XT5000 is READY XX,Y}”. Now the XT5000 goes into normal operation and is ready to send/receive more message from or to the Hologram Cloud. As well as, machines, sensors and devices can be connected to XT5000 now.

Note 1: Ignore the received message in the window “All activity” in the Hologram Dashboard. An example of this message like the picture below.



Regarding the “All activity” window, sometimes the user needs to refresh the window to show the sent and received messages.

Note 2: Every time it sends a message from the Hologram Cloud to XT5000 device, it should wait for receiving the response of the message in the Hologram Cloud before it sends a new message from the Hologram Cloud to XT5000 device.

Note 3: XX in “{XT5000 is READY XX,Y}” is the received signal strength and its value should be over 23 for good operation of XT5000, the max value of XX is 31. Additionally, Y is the quality of the received signal and its value should be below 7. If the values of XX and Y are not matched to the requirements, then the user should move the antenna to better position such as mounting the antenna to higher position and in open area or mounting the antenna outdoor.

Note 4: If XT5000 device does not connect to LTE cellular network and the LED1 does not turn ON not at start up or XT5000 device does not send and receive messages from Hologram Cloud or there is high delay on the received messages from XT5000. In this situation, restart the XT5000 device or the user should do the following:

A. The user should move the antenna to better position such as mounting the antenna to higher position and in open area or mounting the antenna outdoor.
B. The user should refresh the network connection by doing the action of “Pause data usage” in Hologram Dashboard for the device SIM and wait 5 minutes and then doing the action of “Resume data usage” for the device SIM in the Hologram Dashboard and wait for the Device SIM is ready again. Afterwards, the user should wait at least 5 minutes after the device SIM is ready again and then restart the XT5000 device.

3.2 Setting up XT5000 after getting restarted or power up

If XT5000 device is already registered with a HYPER IoT SIM Card in the Hologram Dashboard and the device is used before but it is just getting restarted or powered up, then follow steps below to make XT5000 go into normal operation after getting restarted or power up.

1. Wait 1-2 minutes until the XT5000 configure its self after restart or power up and make sure the LED2 and LED3 are turned ON. The LED4 in the XT5000 device becomes ON after the XT5000 self-configuration is finished. Furthermore, the SIM status of the device in Hologram Dashboard will be changed to “connected” and the LED1 will be turned ON. The LED1 is turned ON when XT5000 device is currently connected to the Mobil network. Make sure all the LEDs of LED1, LED2, LED3 and LED4 are turned ON before you proceed to next step (step 2).

2. As soon as the LED4 becomes ON, the user should send a message that includes the SIM card device key to the XT5000 device. You may send messages to XT5000 from the device SIM page in the Hologram Dashboard. Select the device SIM in Hologram Dashboard and then click on “Manage SIMs” and select from the list “Send Message to SIM”. New window will be opened, make sure to select Cloud data in the new window and with Protocol “TCP” as shown in figure 3-3. Regarding the port, type the number “4010” and for the Data, type “D_K:xxxxxxxx”, where the x characters are just example for the device key that you will get it from Hologram Dashboard. Then wait few seconds and when you click on “Send message”, the Hologram Cloud will forward the message to the XT5000 device. The SIM card device key can be found by going into Webhooks tab inside the device SIM page.

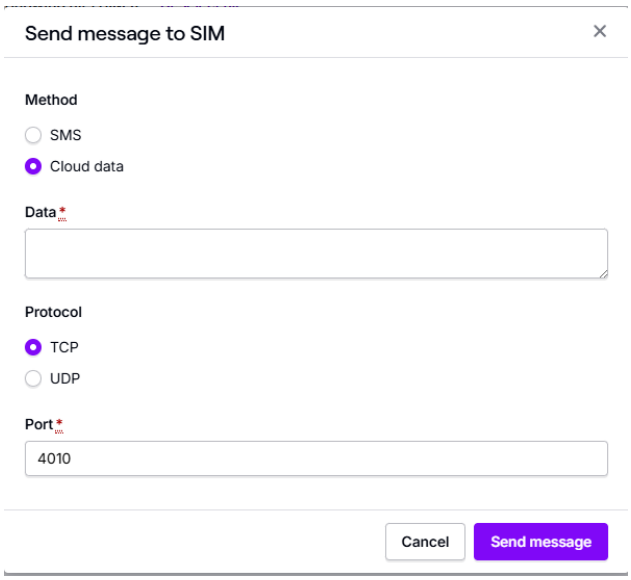
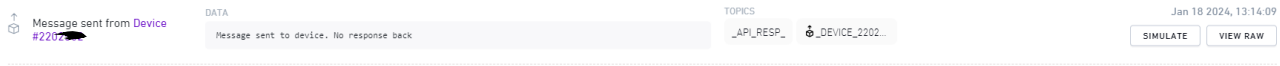


Figure 3-3. Messaging window for Device – Hologram Dashboard

12. Then wait 20 seconds and in the window “All activity” in the Hologram Dashboard, you will receive the response of the sent message “D_K:xxxxxxxx” which is “{XT5000 is READY XX,Y}”. Now the XT5000 goes into normal operation and is ready to send/receive more message from or to the Hologram Cloud. As well as, machines, sensors and devices can be connected to XT5000 now.

Note 1: Ignore the received message in the window “All activity” in the Hologram Dashboard. An example of this message like the picture below.



Regarding the “All activity” window, sometimes the user needs to refresh the window to show the sent and received messages.

Note 2: Every time it sends a message from the Hologram Cloud to XT5000 device, it should wait for receiving the response of the message in the Hologram Cloud before it sends a new message from the Hologram Cloud to XT5000 device.

Note 3: XX in “{XT5000 is READY XX,Y}” is the received signal strength and its value should be over 23 for good operation of XT5000, the max value of XX is 31. Additionally, Y is the quality of the received signal and its value should be below 7. If the values of XX and Y are not matched to the requirements, then the user should move the antenna to better position such as mounting the antenna to higher position and in open area or mounting the antenna outdoor.

Note 4: If XT5000 device does not connect to LTE cellular network and the LED1 does not turn ON not at start up or XT5000 device does not send and receive messages from Hologram Cloud or there is high delay on the received messages from XT5000. In this situation, restart the XT5000 device or the user should do the following:

A. The user should move the antenna to better position such as mounting the antenna to higher position and in open area or mounting the antenna outdoor.
B. The user should refresh the network connection by doing the action of “Pause data usage” in Hologram Dashboard for the device SIM and wait 5 minutes and then doing the action of “Resume data usage” for the device SIM in the Hologram Dashboard and wait for the Device SIM is ready again. Afterwards, the user should wait at least 5 minutes after the device SIM is ready again and then restart the XT5000 device.

4. IO Interface ports in XT5000

The IO interface ports are 3 ports and they are isolated. That means all pins in the ports are isolated. This isolation on the IO interface ports provide many advantages for the communications with XT5000 as it has mentioned previously in section 1.

These IO interface ports are used for the connections of Digital input and digital output and ADC and SPI communications and DC voltage rail with external Slave devices and Loads for different industrial applications such as monitoring and control and measuring and DC rail power supply.

The name of the IO interface ports are A, B and C. Here in this section, it has been descripted each port and its pins connection functions and functions electrical specifications and electrical connection methods in this user manual document.

4.1 IO Interface port A

In IO interface port A in XT5000, the external devices can be connected with Digital input and Digital output.

4.1.1 Digital input in port A

There are 3 inputs of isolated optically coupled phototransistor with high isolation voltage 3000Vrms and overvoltage protection for Digital input in port A. Refer to the document "**XT5000 Data sheet**" for more Electrical specifications. The inputs can typically be used for data controller such as µC or power supply switching or programmable controller.

Additionally, the voltage input range of the digital inputs is 10 – 30V DC for activation and voltage input range 0 – 2V DC maximum for deactivation of the digital inputs. It can be used external DC power supply for the voltage input range of the digital inputs.

The pins connection description can be seen in the table 4-1 and the electrical connection diagram can be seen in the figure 4-1 below for Digital input in port A.

Pin No. in port A	Pin name in port A	Descriptions
1	DI0	Positive node of Digital input channel 0 - port A
2	DI1	Positive node of Digital input channel 1 - port A
3	DI2	Positive node of Digital input channel 2 - port A
4	GND-DI	Negative node of all Digital input channels - port A

Table 4-1. Pins Connection for Digital input channels in port A

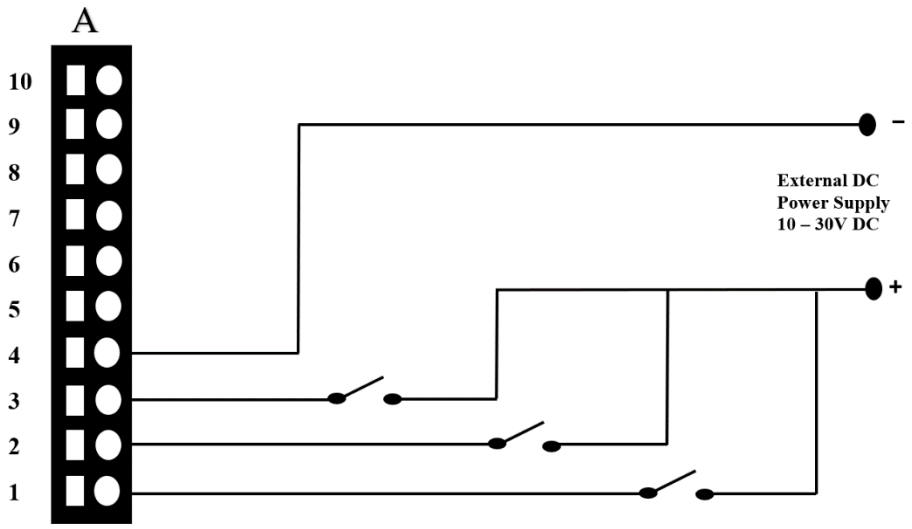


Figure 4-1. Electrical Connection Diagram for Digital input channels in Port A

4.1.2 Digital output in port A

There are 2 smart outputs of isolated optically coupled Photorelay with high isolation voltage 3000Vrms and high output DC current (Load current) up to max 0.5A and overvoltage protection for Digital output in port A. The Digital output in port A is feeding with external DC supply voltage for a voltage range 5 - 30V DC. Refer to the document "**XT5000 Data sheet**" for more Electrical specifications. The outputs can typically be used for control of DC load.

Photorelay is a Solid-state relay (SSR) and it is replacement for mechanical relay and it has many advantages than the mechanical relay such as high reliability (long life) and low input voltage and excellent switching characteristics (high speed, low noise). The Photorelay has high power MOSFET output.

As it has mentioned previously, there are 2 channels for Digital output in port A. The pins connection description for Digital output in port A can be seen in table 4-2 and table 4-3. The electrical connection diagram can be seen in the figure 4-2 below. Additionally, the connection type for Digital output in port A is source type.

Keep the maximum load current 0.5A DC for each digital output channel in port A. Use external DC power supply that can supply at least this load current or more.

Pin No. in port A	Pin name in port A	Descriptions
7	EX_SUPPLYDO0_V+	Positive node of external DC power supply for channel 0 - port A
6	DO0_V+	Positive node for digital output channel 0 - port A
5	GND-DO0_V-	Negative node for digital output channel 0 and Negative node of external DC power supply for channel 0 - port A

Table 4-2. Pins Connection for Digital output channel 0 in port A

Pin No. in port A	Pin name in port A	Descriptions
10	EX_SUPPLYDO1_V+	Positive node of external DC power supply for channel 1- port A
9	DO1_V+	Positive node for digital output channel 1 - port A
8	GND-DO1_V-	Negative node for digital output channel 1 and Negative node of external DC power supply for channel 1 - port A

Table 4-3. Pins Connection for Digital output channel 1 in port A

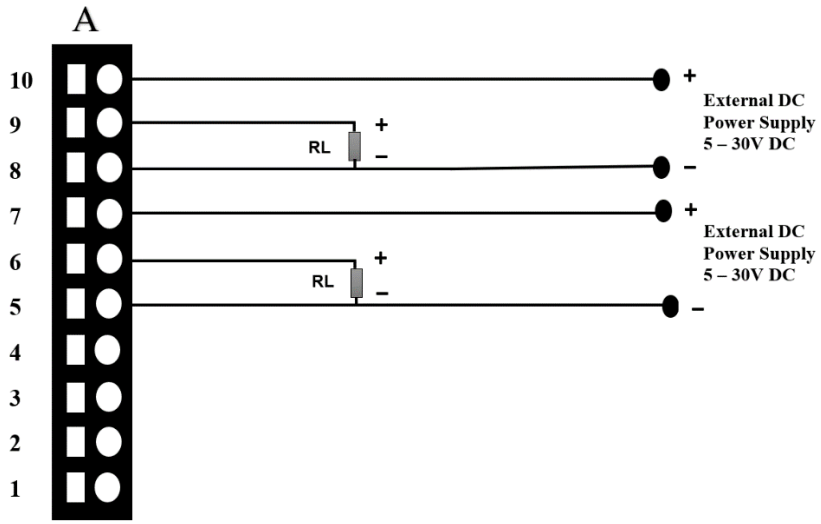


Figure 4-2. Electrical Connection Diagram for Digital output channels in Port A

WARNING Users should not connect and share any of the Digital output connections in port A with other connections in XT5000. For example, the GND (-) connection in External power supply above in figure 4-2 should not be connected and shared with other GND (-) connection in XT5000 because it can flow high load current up to 0.5A from this External power supply.

Note: Guarantee for device XT5000 is not valid in case of misuse of the device

4.2 IO Interface port B

In IO interface port B in XT5000, the external devices can be connected with Analog to Digital Converter and Digital input.

4.2.1 Analog to Digital Converter in port B

There are 3 inputs of isolated precision amplifier with high isolation voltage 2000Vrms and overvoltage protection and high input impedance over 1MOhms for Analog to Digital Converter in port B. Refer to the document "**XT5000 Data sheet**" for more Electrical specifications.

The Analog to Digital Converter in port B can be one of the following configurations below:

- 3 input channels for voltage measurement mode (default mode).
- 2 input channels for voltage measurement mode and 1 input channel for current measurement mode.

The configuration of 3 input channels for voltage measurement mode for Analog to Digital Converter in port B will be default configuration in XT5000. The second configuration can be set in XT5000 after order request.

The voltage input range of the Analog to Digital Converter in port B is 0 -10V DC and for the current input range is 0 - 25mA DC. The Resolution of the Analog to Digital Converter is 10 bits (Digital range: 0 - 1023).

The pins connection description for Analog to Digital Converter (ADC) in port B can be seen in table 4-4 and table 4-5 for configuration of voltage mode and current mode. The electrical connection diagram can be seen in the figure 4-3 and figure 4-4 for configuration of voltage mode and current mode below. Additionally, the connection type for Analog to Digital Converter (ADC) in port B is Single-Ended for both configurations.

Pin No. in port B	Pin name in port B	Descriptions
4	AI0-Voltage	Positive node of ADC for channel 0 - Voltage mode - port B
6	AI1-Voltage	Positive node of ADC for channel 1 - Voltage mode - port B
8	AI2-Voltage	Positive node of ADC for channel 2 - Voltage mode - port B
10		This pin should be not used in this configuration (3 input channels for voltage measurement mode)
3	GND-AI0-Voltage	Negative node of ADC for channel 2 - port B
5	GND-AI1-Voltage	Negative node of ADC for channel 1 - port B
7	GND-AI2-voltage	Negative node of ADC for channel 0 - port B

Table 4-4. Pins Connection for Analog to Digital Converter (ADC) in port B for configuration of 3 input channels for voltage measurement mode

Pin No. in port B	Pin name in port B	Descriptions
4	AI0-Voltage	Positive node of ADC for channel 0 - Voltage mode - port B
6	AI1-Voltage	Positive node of ADC for channel 1 - Voltage mode - port B
10	AI2-Current	Positive node of ADC for channel 2 - Current mode - port B
8		This pin should be not used in this configuration (2 input channels for voltage measurement mode and 1 input channel for current measurement mode)
3	GND-AI0-Voltage	Negative node of ADC for channel 2 - port B
5	GND-AI1-Voltage	Negative node of ADC for channel 1 - port B
9	GND-AI2-Current	Negative node of ADC for channel 0 - port B

Table 4-5. Pins Connection for Analog to Digital Converter (ADC) in port B for configuration of 2 input channels for voltage measurement mode and 1 input channel for current measurement mode

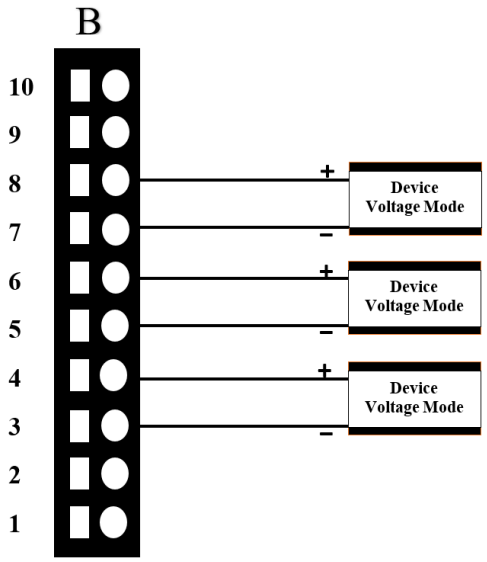


Figure 4-3. Electrical Connection Diagram for Analog to Digital Converter in Port B for configuration of 3 input channels for voltage measurement mode

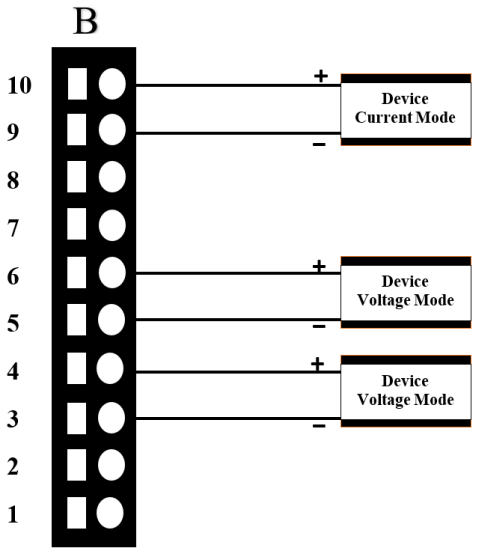


Figure 4-4. Electrical Connection Diagram for Analog to Digital Converter in Port B for configuration of 2 input channels for voltage measurement mode and 1 input channel for current measurement mode

4.2.2 Digital input in port B

There is 1 input of P-channel MOSFET with high isolation voltage 2000Vrms and overvoltage protection for Digital input in port B. Refer to the document "**XT5000 Data sheet**" for more Electrical specifications. The input can typically be used for data controller interface such as µC and data transmissions.

Additionally, the voltage level of the isolated digital input is 3.3V DC or 5V DC for activation and 0.2V DC maximum for deactivation of the isolated digital input.

The pins connection description can be seen in the table 4-6 and the electrical connection diagram can be seen in the figure 4-5 below for Digital input in port B.

Pin No. in port B	Pin name in port B	Descriptions
2	DIW	Positive node of Digital input channel W- port B
1	GND-DIW	Negative node of digital input channel W - port B

Table 4-6. Pins connection for Digital input channel W in port B

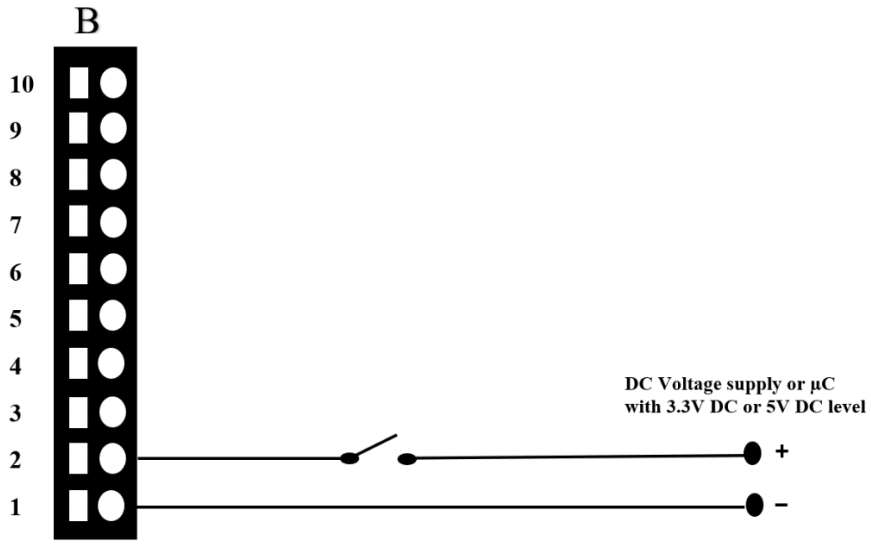


Figure 4-5. Electrical Connection Diagram for Digital input channel W in Port B

4.3 IO Interface port C

In IO interface port C in XT5000, the external devices can be connected with DC voltage rail and Digital output and SPI communications.

4.3.1 DC Voltage Rail in port C

The level of the DC voltage rail in port C is positive 3.3V DC and it is high isolated with 2000Vrms. The DC voltage rail +3.3V has overload protection and can supply up to max 50mA load current. Refer to the document "**XT5000 Data sheet**" for Electrical specifications. The DC voltage rail +3.3V DC can be used as power supply for different devices and circuits such as modules, amplifiers, sensors, µC, data converter. The pins connection description can be seen in the table 4-7 and the electrical connection diagram can be seen in the figure 4-6 below for the DC voltage rail +3.3V in port C. The pins 10 or 9 in port C can be used as Ground node at the connection of DC voltage rail +3.3V DC with external device or circuit.

Pin No. in port C	Pin name in port C	Descriptions
8	+3.3V-OUT	Output DC voltage rail +3.3V DC - port C
10 and 9	DO-Rail-GND	Ground node for DC voltage rail +3.3V and Digital output - port C

Table 4-7. Pins connection for DC Voltage Rail +3.3V in port C

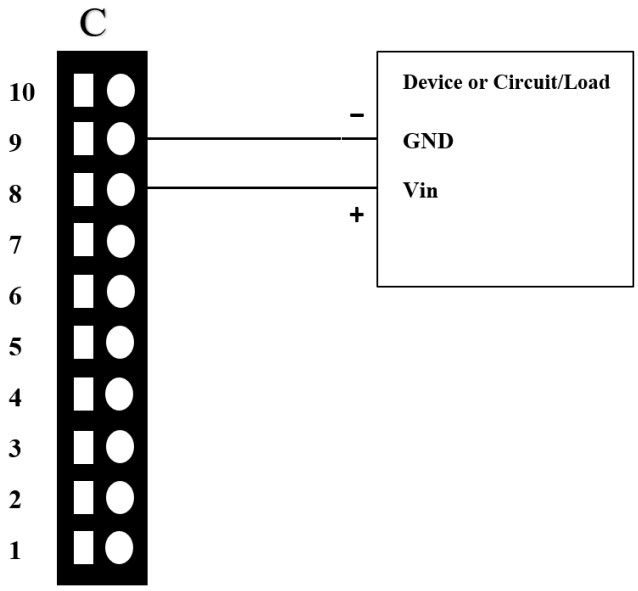


Figure 4-6. Electrical Connection Diagram for DC Voltage Rail +3.3V in Port C

4.3.2 Digital output in port C

There are 2 outputs of P-channel MOSFET with high isolation voltage 2000Vrms and overvoltage protection and load current up to 20mA for Digital output in port C. Refer to the document "**XT5000 Data sheet**" for more Electrical specifications. The outputs can typically be used for switching of Solid-state relay (SSR) such as high power MOSFET. Furthermore, the outputs can also be used for data controller interface such as µC.

Additionally, the voltage level of the isolated digital output in port C is 3.3V DC for activation and 0.1V DC maximum for deactivation of the isolated digital outputs in port C.

The pins connection description can be seen in the table 4-8 and the electrical connection diagram can be seen in the figure 4-7 below for Digital output in port C.

Pin No. in port C	Pin name in port C	Descriptions
6	DO2	Digital output channel 2 - port C
7	DO3	Digital output channel 3 - port C
10 and 9	DO-Rail-GND	Ground node for Digital output and DC voltage rail +3.3V - port C

Table 4-8. Pins connection for Digital output in port C

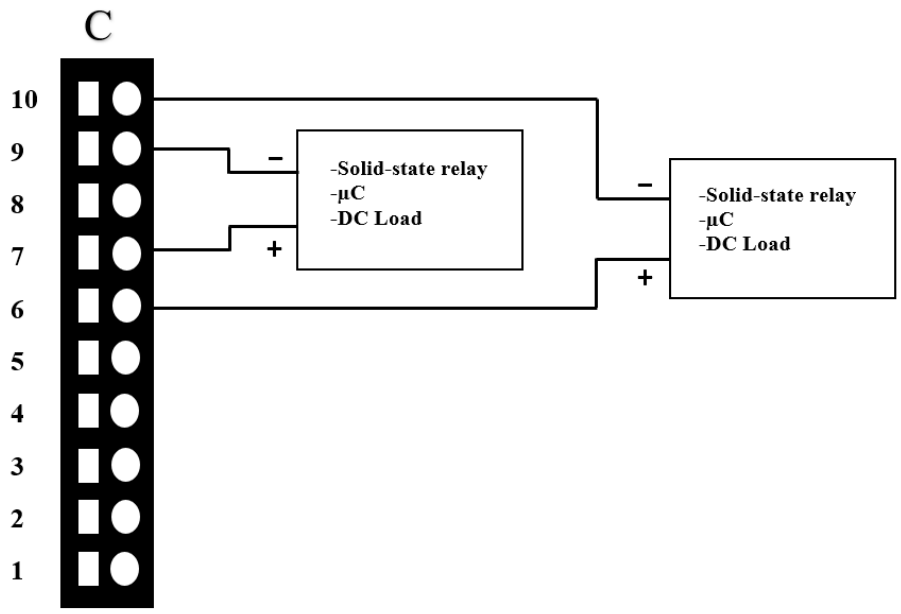


Figure 4-7. Electrical Connection Diagram for Digital output in Port C

4.3.3 SPI Communications in port C

There are interface connections for Master SPI with high isolation voltage 2000Vrms and ESD protection and overvoltage protection in port C. The interface connections can be connected to Slave SPI device for SPI Communications. The speed of the Master SPI Communication is over 2 MHz (SPI Clock 2.3 MHz). Furthermore, the mode of the Master SPI is mode 0 (CKP = 0, CKE = 0) which is the most used mode in SPI Communications. Refer to the document "**XT5000 Data sheet**" for Electrical specifications.

The voltage level of SPI communications for Master SPI in XT5000 is 3.3V DC and external connected Slave SPI device or sensor should be the same voltage level 3.3V DC.

The pins connection description can be seen in the table 4-9 and the electrical connection diagram can be seen in the figure 4-8 below for SPI Communications in port C. The pin 8 connection for DC voltage rail +3.3V in port C can be used for powering of Slave SPI device or sensor.

If it is desired to power a Slave SPI device or sensor by external power source +3.3V, the pin 8 connection can be ignored in the figure 4-8 below.

Pin No. in port C	Pin name in port C	Descriptions
5	SPI-GND	Ground node for SPI Communications - port C
3	CS	SPI - Chip Select - port C
4	MISO	SPI - Master in Slave out - port C
2	SCLK	SPI - SPI Clock - port C
1	MOSI	SPI - Master out Slave in - port C
8	+3.3V-OUT	Output DC voltage rail +3.3V DC - port C

Table 4-9. Pins connection for SPI Communications in port C

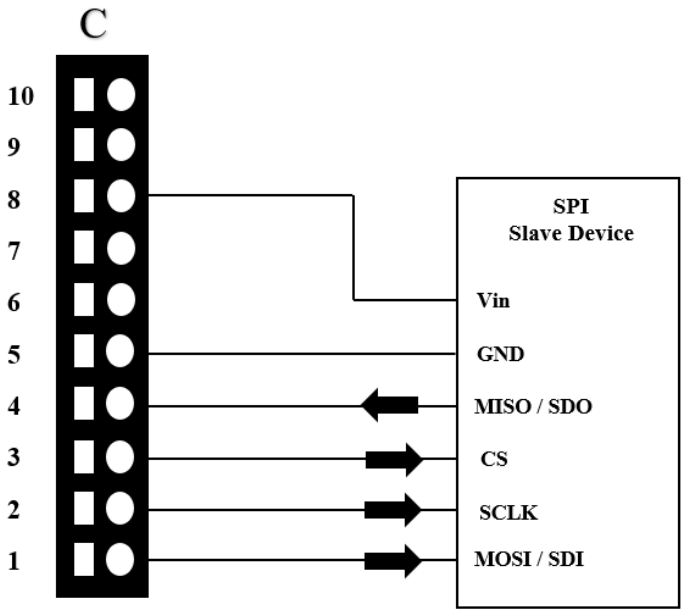


Figure 4-8. Electrical Connection Diagram for SPI Communications in Port C

5. References

[1] Getting Global Hyper IoT SIM Card

https://store.hologram.io/

[2] Register and activate Global Hyper IoT SIM Card in Hologram Dashboard

https://support.hologram.io/hc/en-us/articles/360035697873-How-do-I-activate-SIMs

[3] Create Free Hologram Dashboard account

https://dashboard.hologram.io/org/67568/?from=login&page=1

[4] Hologram Dashboard homepage

https://support.hologram.io/hc/en-us/articles/4408518662807-Hologram-Dashboard-homepage

[5] Getting Device Key

https://support.hologram.io/hc/en-us/articles/360035212714-Device-keys

[6] Send a Hologram Cloud message to your device

https://support.hologram.io/hc/en-us/articles/360050139473-Send-a-TCP-or-UDP-message-to-your-device

[7] Hologram Routes

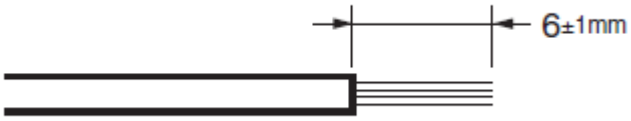
https://support.hologram.io/hc/en-us/articles/360035696573-Hologram-Routes

6. Appendix A

Push-in Terminals Block is easy to complete connections for the IO interface ports A, B and C. Here below you will find more details on how to connect wire to the terminal blocks and the tool that you need it for complete the connections. See below the connection methods in figure 6-2 and figure 6-3.

6.1 Wiring Terminal Blocks

1. Use wires with conductors that are within the connectible wire range. Refer to the document "**XT5000 Data sheet"** for wire range.
2. Prepare the ends of the wires like the picture here below.



3. Do not presold the ends of the wires. Doing so will prevent correct connections.

6.2 Screwdriver for Terminal Blocks

You should use a screwdriver for the terminal blocks with the following dimensions as shown in the figure 6-1 here below.

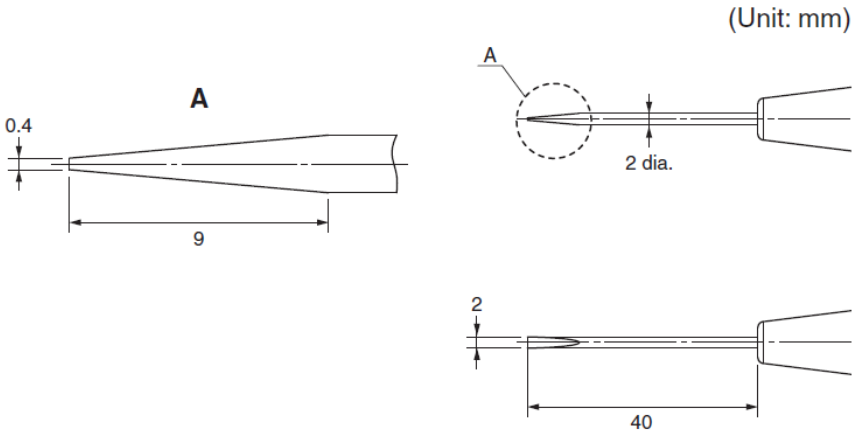


Figure 6-1. Screwdriver dimensions for the Terminal Blocks

• Just insert solid wires or ferrules to complete wiring. With Stranded wires, all you need is a flat-blade screwdriver.

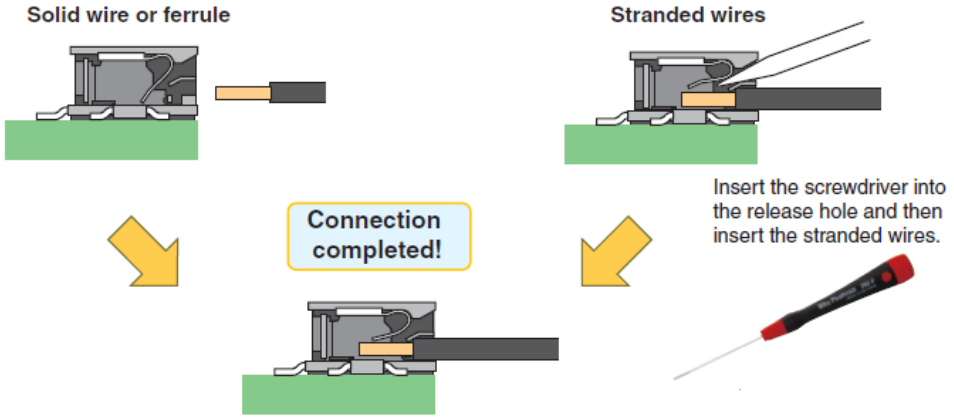


Figure 6-2. Terminal Block connection methods with a wire

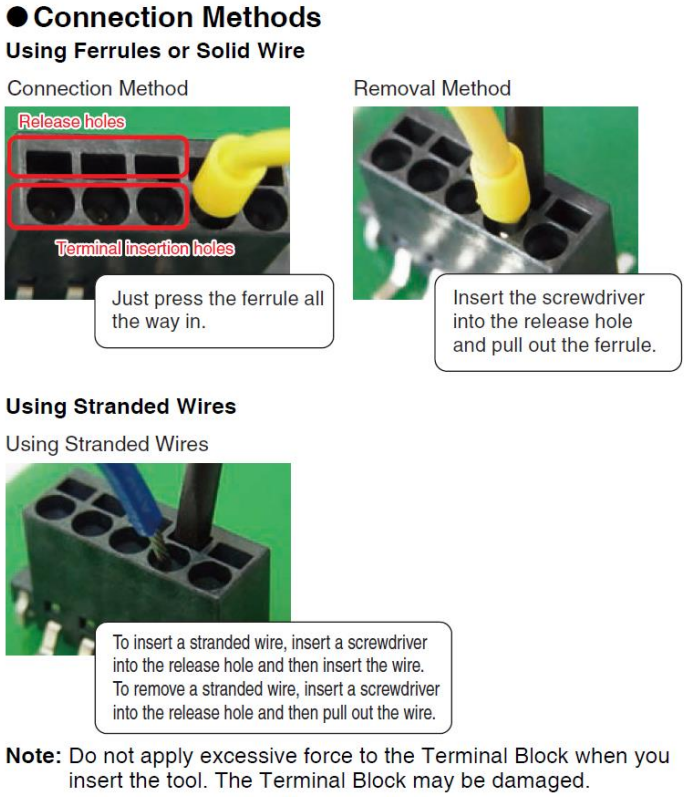


Figure 6-3. Terminal Block connection methods with a wire

7. Appendix B

7.1 Mechanical Dimensions of XT5000

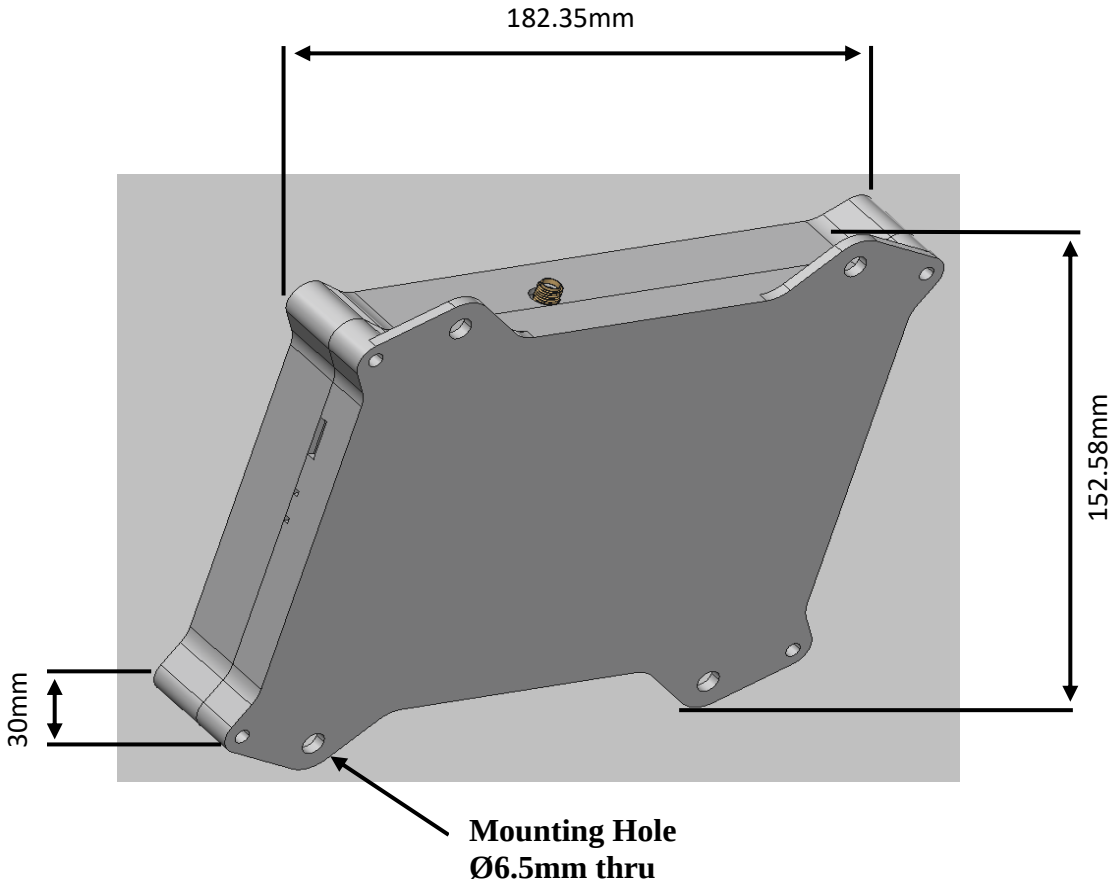


Figure 7-1. Dimensions of XT5000

8. Appendix C

8.1 I-Bar Adhesive Cellular Network Antenna for XT5000

The I-Bar adhesive mount cellular network antenna is compact form factor and is easily mounted indoor/outdoor. The antenna is Ultra-Wide-Band Omni antenna that covers LTE 5G, 4G and 3G networks. The antenna has max Gain 5.2dBi and high efficiency in frequency range 617-6000MHz. This antenna will be delivered with XT5000.

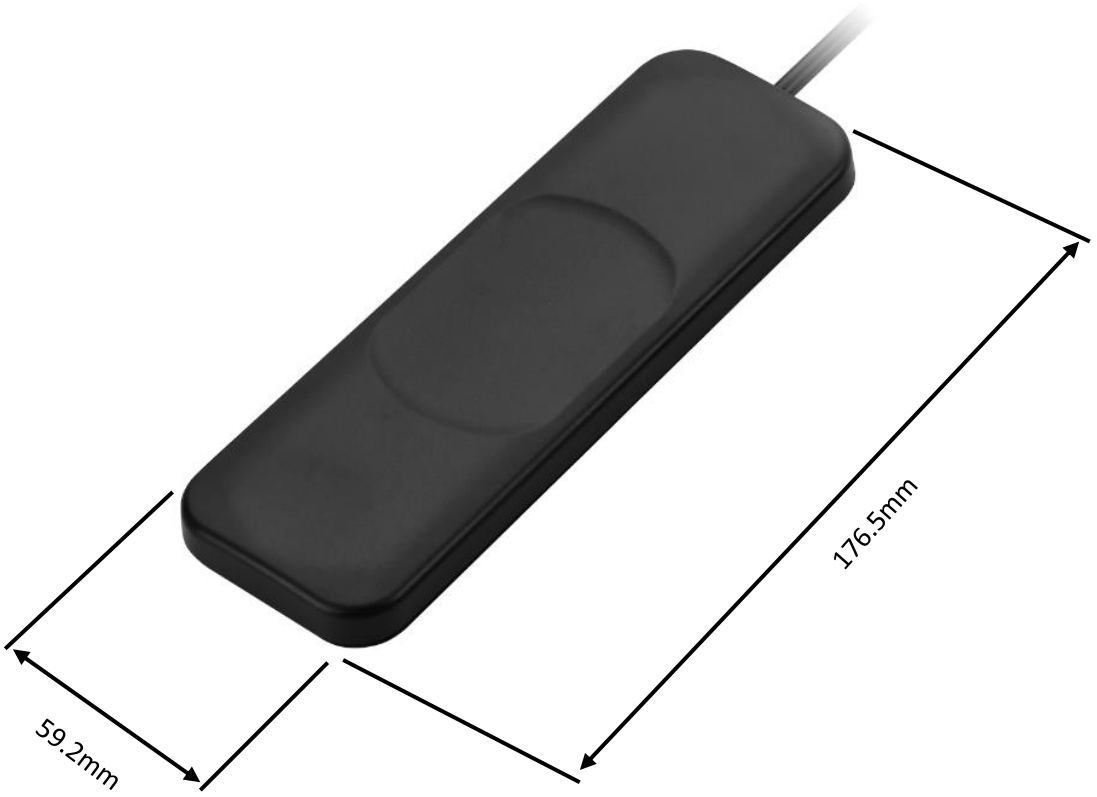


Figure 8-1. I-Bar Adhesive Cellular Network Antenna for XT5000 and its dimensions

8.2 Mounting of I-Bar Adhesive Cellular Network Antenna

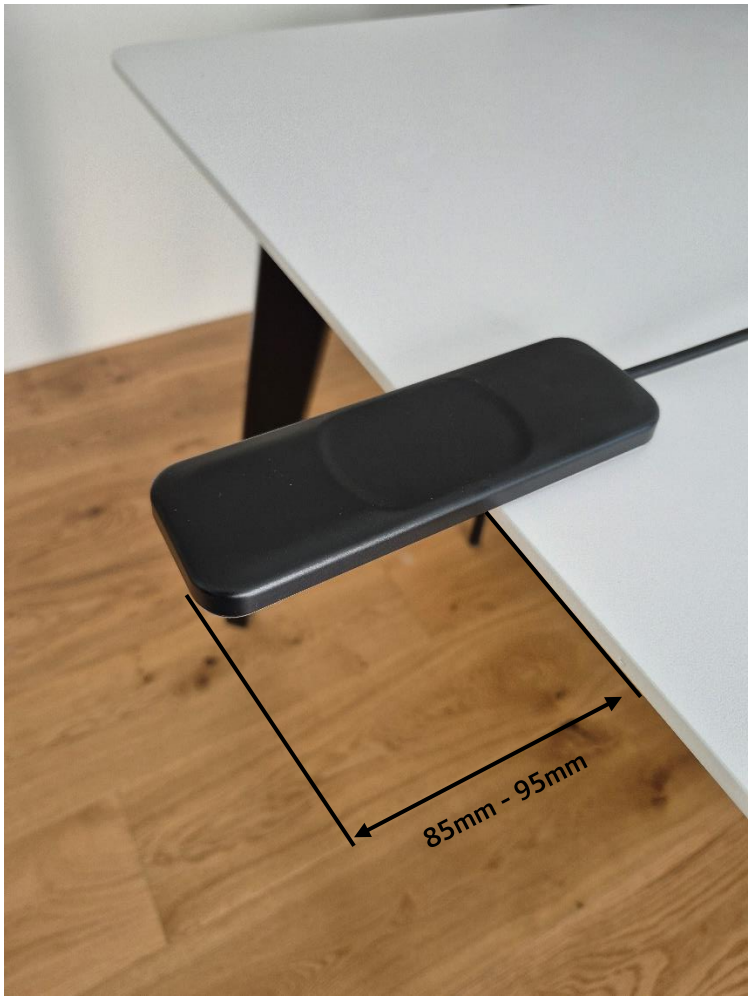


Figure 8-2. Mounting of I-Bar Adhesive Cellular Network Antenna for XT5000 in free space

As shown in the figure 8-2 above, the antenna should be mounted between 85mm - 95mm in free space. Also, the height of antenna should be over 1 meter from the ground and there are no obstacles around the antenna for correct signal strength level, it is important to mount the antenna in open area. The antenna has standard cable length 1 meter for indoor and outdoor mounting. The user can order the antenna with 2 – 3 meter antenna cable length that works only for outdoor mounting.

Figure 8-3. Outdoor mounting of I-Bar Adhesive Cellular Network Antenna for XT5000 on the Glass base

8.3 Hinged Dipole Cellular Network Antenna for XT5000

The hinged dipole cellular network antenna is slim-line antenna. The antenna is Ultra-Wide-Band Omni antenna that covers LTE 5G, 4G and 3G networks. The antenna has max Gain 4.9dBi and high efficiency in frequency range 600-6000MHz. This antenna can be delivered with XT5000 instead of the I-Bar Adhesive Cellular Network Antenna with request.

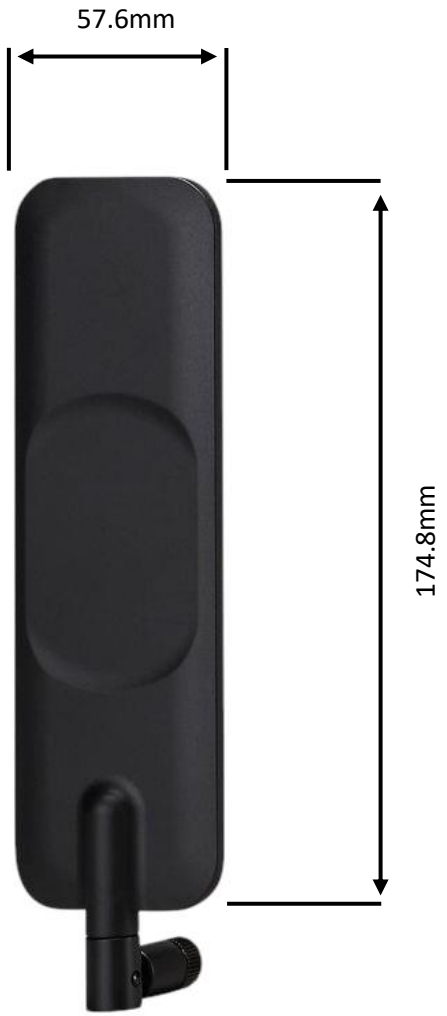


Figure 8-4. Hinged Dipole Cellular Network Antenna for XT5000 and its dimensions

8.4 Mounting of Hinged Dipole Cellular Network Antenna

Figure 8-5. Straight Mounting of Hinged Dipole Cellular Network Antenna for XT5000

Figure 8-6. Bent 90° Mounting of Hinged Dipole Cellular Network Antenna for XT5000