INOVANCE

User Guide

IT6000-IOT Series HMI

19010871 A01

Overview

Thank you for purchasing the IT6000-IOT series touch screen human-machine interface (HMI) developed and manufactured by Inovance Control Technology. This series HMI includes two models, IT6070EG-IOT and IT6070EG-DIOT. This series HMI supports wireless communication. Besides the functions of the IT6000, it additionally provides the IoT communication and remote access functions, realizing one-stop remote intelligent management of field devices. The IT6000-IOT HMI adopts powerful A8 core processor, making data processing and response faster. It allows connection to the server by using GPRS or Ethernet, supporting more functions over the original IT6000, including uploading, downloading, and monitoring of PLC programs.

This user guide describes the specifications, features, and usage of the HMI. Before using the product, read this document carefully to understand the product features better and use the product more safely. For the developing environment and design method of user programs of the product, refer to the InoTouch Editor online help issued by Inovance. Obtain the latest software at www.inovance.com.

1. Function Advantages

Function Advantages	Function Descriptions
Remote monitoring on devices such as PLC and AC drive	The HMI can connect to devices such as PLC, AC drive or servo drive through the Ethernet port, RS485 port, or RS232 port, collect data of these devices, and upload the data to the server through the WAN. The HMI can also send the control commands from the server to the PLC, AC drive or servo drive to perform monitoring on these devices.
Multi-level access rights	The HMI provides the multi-level access rights management function. Different access roles are configured with different access objects and operation rights.
Remote download	Users can update programs of the HMI and related devices by using wireless GPRS and PC, and maintain multiple network devices at one-stop without going to the field.
Historical recording	The HMI can monitor and record the device running status in real time. The device online status, alarm information, and historical data are recorded on the Web. When a fault occurs on the device, the system uploads and records the fault in the server.
Communication and logic programming	In the AutoShop software, users can carry out the HMI program setting and modify the communication protocol and logic control.
Other advantages	The built-in GPRS antenna eliminates the field wiring. The general GPRS network supports China Mobile and China Unicom. The HMI supports Inovance IoT access point network (APN) card, requiring very low traffic cost.

2. Safety Instructions

■ Safety Precautions

1) Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
2) To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide.
3) "CAUTION", "WARNING", and "DANGER" items in the manual do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
4) Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
5) Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Design

DANGER

- Configure protective interlock circuits for stopping or restricting conflicting operations (such as forward/reverse rotation, upper/lower limit positioning and reciprocating movement), emergency stop circuits, and protection circuits on the exterior of the product o prevent equipment damage.
- Configure a "fault protection circuit" on the exterior of the product to prevent accidental mechanical movement of the input/output control area that does not allow detection.
- Design a user program to ensure the system safety when a display, control communication, or power fault occurs.
- Ensure that a communication fault between the product and the controller will not lead to device function abnormality. This is to avoid personal injury or equipment damage.

CAUTION

- Do not create switches that may result in personal injury or equipment damage on the touch screen. Design independent switches for performing important operation; otherwise, wrong outputs or faults may result in accidents.
- Do not create switches on the touch screen, such as emergency stop switch, that are used to control device safety operations. Set independent hardware switches for performing safety operations to prevent severe personal injury or equipment damage.
- Do not use the product as the alarm device to report important alarms that may cause severe personal injury, equipment damage or system shutdown. Use an independent hardware and/or mechanical interlock for designing the important alarms and related control/triggering devices.

Installation

DANGER

- The product can be used only indoors. Ensure that the HMI is installed correctly in an environemtn complying with the requirements in the "Basic Parameters: Specifications".
- Install the product free from high magnetic filed, direct sunligh, high temperature, explosion hazards due to combustible gas, vapor and dusts.
- Install the product free from fast temperature variation and high humidity; otherwise, condensation may occur inside the equipment, resulting in equipment damage.
- Ensure that all cables are connected to the product securely. If the connection becomes loose, wrong input or output signals may be caused.

CAUTION

- If the HMI is installed in an environment outside the storage temperature range recommended in the manual, an LCD display fault may be caused.

Wiring

DANGER

- Ensure that all power supplies are cut off before installation or wiring. Perform wiring and plug or remove the cable connector only after power-off. Failure to comply will result in electric shock or damage to the circuit.
- Connec the DC power supply to the specificifed terminals.
- During screw hole processing and wiring, ensure that no metal filings or cable end drops into the product. Failure to comply may result in a fire, a fault or electronic component damage.
- Check cable connections carefully and ensure that the working voltage and terminal wiring are correct. Failure to comply may result in a fire or an accident.

CAUTION

- Ensure that all power supplies are cut off before installation or wiring.
- The input power of the product is 24 VDC. If the power input is not within 24 VDC±20%, the product will be damaged severely. Thus, check regularly whether the DC power provided by the switching-mode power supply is stable.

Running and Maintenance

CAUTION

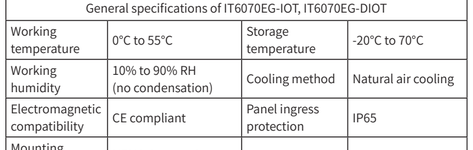
- Perform operations on the touch screen only with hands. Users shall take responsibilities for the damage caused by performing the product with tools.
- Components such as lithium cell, LCD scree, and capacitor may contain elements that harm health and pollute the environment. Treat them as ordinary industrial waste.

■ Safety Suggestions

1) Use a manual device or other optional method independent of the PLC for starting or interrupting automatic running of the system, in positions where the operator directly touchs the mechanical part, for example, positions of installing or removing the mechanical tool, or in positions of automatic machine running.
2) Use a lock or other measures to ensure that only authorized personnel can modify programs during system running.

3. Product Information

Designation Rules



1) Basic Parameters

Parameter	Specification	Parameter	Specification
Hardware specifications of IT6070EG-IOT, IT6070EG-DIOT			
Display size	7.0"	Resolution	800 x 480
Brightness (cd/㎡)	300	Display color	21-bit true color
Backlight source	LED	Backlight service life	30,000 hours
CPU	Cortex A8 600 Mhz	Flash	128 MB
DRAM	128 MB DDR3	Recipe storage	256 KB
SD card interface	√	USB host	√
USB client	√	Ethernet port	√
Serial port	COM1 (RS422/RS485) COM2 (RS232) COM3 (RS485)	RTC	√
Wireless type	GPRS	Battery[Note]	√
Input voltage	24 VDC ± 20%	Rated current	500 mA
Structure specifications of IT6070EG-IOT, IT6070EG-DIOT			
Housing color	Metal grey	Housing material	ABS+PC engineering plastics
Mounting hole dimensions	192 x 138 (mm)	-	-
General specifications of IT6070EG-IOT, IT6070EG-DIOT			
Working temperature	0°C to 55°C	Storage temperature	-20°C to 70°C
Working humidity	10% to 90% RH (no condensation)	Cooling method	Natural air cooling
Electromagnetic compatibility	CE compliant	Panel ingress protection	IP65
Mounting method	NEMA 4-mounting	-	-

Parameter	Specification	Parameter	Specification
Communication specifications of IT6070EG-IOT, IT6070EG-DIOT			
Function Module	Parameter	Specification	
GPRS	RF frequency band	GSM900, DCS1800 frequency band auto search, compliant with GSM Phase 2/2+	
	Transmitting power	Class4 (2W): GSM900 Class1 (1W): DCS1800	
	Data characteristics	GPRS data downlink transmission: maximum of 85.6 Kbps GPRSdata uplink transmission: maximum of 42.8 Kbps	
	Receiving sensitivity	< -108.5 dBm	
	Certification	CCC	
RS485	Transmission rate	Baud rate ⩽ 115200 bps	
RS232	Transmission rate	Baud rate ⩽ 38400 bps	
USB (device)	USB2.0	Compatible with USB2.0 full-speed transmission	

NOTE

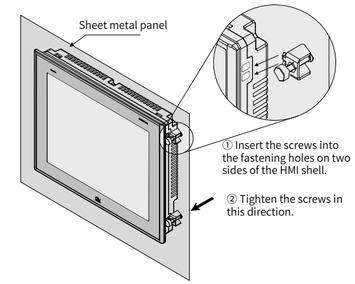
The typical service life of the button battery is 5 years. The actual service life varies according to the working conditions on site (temperature and humidity)

4. Installation

1) Mounting dimensions

2) Mounting method

The HMI supports NEMA-4 mounting. The mounting procedure is shown in the following figure.



a) Put the product into the mounting hole opened in the panel.
b) Insert the four mounting options (delivered with the product) into the four fixing holes on two sides of the product housing (as shown in ① in the figure).
c) Fasten the screws one by one (as shown in ② in the figure) with the recommended torque 6.0 ± 0.5 kgf · cm (to ensure water-proof and prevent shell deformation).

CAUTION

To ensure compliance with NEMA-4 sealing specifications, all mounting options (Inovance option, code: 20140061) delivered with the product must be used. Do not use too large torque when fastening the screws, and the curvature of the mounting floor cannot exceed 0.010".

5. Electrical Design

1) Interface arrangement

2) Interface descriptions

No.	Interface Name	Function Description
(1)	Power supply interface	24 VDC power input interface of the HMI (one power terminal for connecting to this interface delivered with the product)
(2)	COM1/COM3 serial communication ports (DB9 female)	Communication ports between HMI and PLC, including two serial communication ports COM1 and COM3; COM1 with RS485/422 level interface, and COM3 only with RS485 interface
(3)	COM2 serial communication port (DB9 male)	Communication port between HMI and PLC, including two serial communication ports COM2 and RS232 interface
(4)	USB client V2.0 (type B)	USB port for communication with the device, used for PC downloading and user program commissioning
(5)	USB host V2.0 (type A)	USB port for communication with the host, used for data reading of the USB disk, connected to devices such as the mouse and printer
(6)	Ethernet port (RJ45)	Ethernet communication port, built-in Modbus/TCP protocol, used for accessing the PLC with LAN port or accessing PC
(7)	SIM card slot cover	Used for replacing the SIM card
(8)	Power indicator (available only for models including "-D")	Flashing: power supply not stable Steady off: not powered on Steady on: power supply normal

No.	Interface Name	Function Description
(9)	Communication indicator (available only for models including "-D")	Fast flashing (0.1 second/each time): communication normal Slow flashing (1 to 2 seconds/each time): communication interrupted or communication rate low during running Not flashing: communication timeout

NOTE

Battery: The typical service life of the button battery is 5 years. The actual service life varies according to the working conditions on site (temperature and humidity).

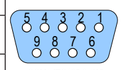
6. Communication Function

■ RS485/422 communication

1) RS485/422 communication port

The two ommunication ports COM1 and COM3 are DB9 female, and are used for connecting devices with RS485/RS422 communication ports such as PLC, AC drive, printer or other intelligent devices. The following table lists the pin assignment of the port.

Pin No.	Signal			Pin Assignment of DB9 Female
	COM1[RS485] 2-wire	COM1[RS485] 4-wire	COM3 [RS485]	
1	RS485-	RX- (receiving negative)	-	
2	RS485+	RX+ (receiving positive)	-	
3	-	TX- (transmitting negative)	-	
4	-	TX+ (transmitting positive)	-	
5	GND (signal ground)			
6	-	-	RS485-	
7	-	-	-	
8	-	-	-	
9	-	-	RS485+	

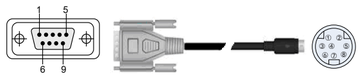


COM1 [RS485 2/4W]
COM3 [RS485]

(COM1 [RS485] 4-wire, that is COM1 [RS422])

2) RS485/422 communication cable

IT5-H2U-CAB* (recommended, cable length 3 meters, ordering No.: 15041140)



Cable connector and pin	DB9 male		(8-Pin DIN round plug)	
Signal level	RS422		RS422	
Internal connection of cables	Pin No.	Signal	Pin No.	Signal
	1	RX-	4	TX-
	2	RX+	7	TX+
	3	TX-	1	RX-
	4	TX+	2	RX+
	5	GND	3	GND
Applicable models and ports	IT6xxx HMI COM1[RS485]4w		Inovance H1U/H2U/H3U RS422 communication ports Mitsubishi FX1N/2N/3U/3G RS422 communication ports	
User program setting of HMI while using this cable	In the HMI user program, select COM1 and set it to "RS485-4W". The HMI and the PLC must be configured with the same communication protocol and data format.			

Differentiate this cable with the RS232 communication cable (H2U-232-CAB, No.: 15042148) .

3) Communication precautions

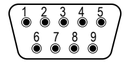
- Lay the cable far from the AC power cable or electrical noise source. Do not insert or remove the communication cable during communication.
- To ensure normal communication, the communication cable length cannot exceed 150 m.
- Use a shielded cable when the communication distance or the electrical noise is large.
- If the communication is abnormal, a fault prompt indicating "PLC no response..." is displayed in the status bar of the HMI.

■ RS232 communication

1) RS232 communication port

The RS232 communication port (COM2) is DB9 male with level signal, and is used for connecting controllers with the RS232 communication port. The following table lists the pin assignment of the port.

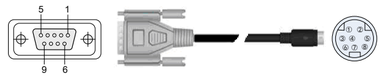
Pin No.	Signal	Pin Assignment of DB9 Male
	COM2[RS-232]	
1	-	
2	RXD (data receiving)	
3	TXD (data transmitting)	
4	-	
5	GND (signal ground)	
6	-	
7	-	
8	-	
9	-	



COM2 [RS232]

2) RS232 communication cable

H2U-232-CAB (ordering No.:15042148)



Cable connector and pin	DB9 female		-
Signal level	RS232, with built-in RS232-RS485 conversion circuit		RS485
Internal connection of cables	Pin No.	Signal	Pin No.	Signal
	1		4	TX-
	2	RXD	7	TX+
	3	TXD	1	RX-
	4		2	RX+
	5	GND	3	GND
Applicable models and ports	IT6xxxE HMI COM2[RS232]		Inovance H1U/H2U/H3U RS422 communication ports Mitsubishi FX1N/2N/3U/3G RS422 communication ports	
User program setting of HMI while using this cable	In the HMI user program, select COM2 and set it to "RS232". The HMI and the PLC must be configured with the same communication protocol and data format.			

3) Communication precautions

To ensure normal communication, the communication cable length cannot exceed 15 m. See the RS485/322 communication precautions for more details.

■ Ethernet communication

1) Communication port

The HMI has the 10M/100M adaptive Ethernet port to provide the following functions:

- Upload and download the HMI configuration, system parameter setting, and configuration online simulation.
- Support multi-HMI connection through the Ethernet.

- Communicate with the PLC through the Ethernet.
- Connect to the hub or Ethernet switch by means of a standard Ethernet cable to access the LAN.
- Connect to the Ethernet port of the PC through a dual interconnect network cable.

2) Communication cable

The Ethernet network cable must be CAT5 STP, metal shielded RJ45 to ensure reliability of device communication.

3) IP address

The default address is 192.168.1.10, which can be changed in System settings; for details, refer to the HMI software online help.

4) Communication precautions

The Ethernet network cable must be shielded cable to ensure communication reliability.

■ GPRS communication

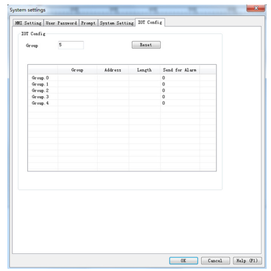
The HMI supports a built-in SIM card to realize GPRS wireless communication.

1) Configuration of Web wireless communication

Step 1: Configure a user project.

Start the latest InoTouch Editor software (see "8 Programming Reference"). Choose New Project > System Setting > IOT Config.

The System settings interface is shown as follows:



[Group]: The values must be the same as those set in the server, and may not be consecutive.

[Address]: The address data is buffered in the HMI LW registers. If the start address is LW1000, enter "1000".

[Length]: Indicates the number of words (16 bits) of the data, that is, the number of LW registers.

Step 2: Collect the data.

Create a macro instruction, read (Get) the parameter data of each group from the target device such as air compressor, and store (Set) the data in the LW register configured.

Invoke this macro instruction to collect data in the HMI project in a timing manner (for example, one second) . The time must be the same as the real-time data refresh period of the server. Compile the HMI project and download it to the HMI. Note that you need to select "firmware" for initial download or first-time download after restoration of the default setting, and select the device model IT6070E-IOT.

Step 3: Perform Web setting.

To use the monitoring function, apply for the rights to Inovance and log in to the specified web page and view data with the given account and password. The label indicating the unique registration code of each device is sticked on the back cover of the device.

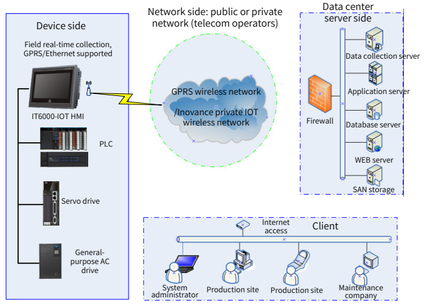
2) Description of signal strength indication

Signal Icon	Indication
	The device is not connected to the server.
	The device is connected to the server through GPRS. The green bars indicate the signal strength. 0 to 1 bars in green: The signal quality is poor, and disconnection may occur during usage. You are suggested to adjust the direction. 2 to 3 bars in green: The signal quality is medium, indicating normal usage with small transmission delay. 4 to 5 bars in green: The signal quality is good, and communication is normal.

Signal Icon	Indication
	The device is connected to the server through Ethernet.
	The device was connected to the server through Ethernet successfully, but Ethernet disconnection occurs.

7. Typical Application

The following figure shows the typical application of IT6070EG-IOT and IT6070EG-DIOT.



The HMI is connected to the running devices onsite through RS485, RS232 or Ethernet port to obtain the real-time data and accesses the server in the Inovance remote network (VPN) through GPRS or Ethernet. Users can access the server to obtain the running status of the HMI and subordinate devices.

8. Programming Reference

1) To carry out programming on the HMI, you need to make preparations according to the following table:

Hardware	Description
A computer	Install Inovance InoTouch Editor software, which can be obtained from the HMI provider, or Inovance website http://www.inovance.com.
A programming cable	The general programming cable for this HMI is USB programming cable, provided by Inovance (option), ordering model:IT5-USB-CAB, ordering No.: 15041123.
IT6000-IOT series HMI	-

2) Computer configuration requirements (recommended)

Configuration	Specification
CPU	Intel or AMD of main frequency above 2 GHz
Memory	1 GB or above
Hardware	At least 1 GB idle disk
Display	Color display of 1024 x 768 and above
Ethernet port or USB port	Used for uploading and downloading image program
Operating system	Windows XP or Windows 7

For the connection between the HMI and other brands' PLCs, refer to the InoTouch Editor online help.

3) HMI programming resource

The IT6000-IOT integrates the programming resources for the GPRS wireless function based on the IT6000. The following table lists the major programming resources of the IT6000-IOT. For more details, refer to the InoTouch Editor online help.

Name	Width	Descriptions
LB	0 to 11999	Bit system register
LW	0 to 10255	Byte system register (for the registers defined, refer to the Inotouch Editor online help)
RW	0 to 65535	Byte system register with retentive function at power failure
RW_A	0 to 65535	Byte system register with retentive function at power failure, different from RW
LB	10808	Server connection status (ON: connected, OFF: disconnected)

Name	Width	Descriptions
LW	9844	Signal strength and connection status 0: not connected 1 to 6: Connected to server successfully, signal strength 0 to 5 7: Ethernet connection normal 8: Disconnected from Ethernet
LW	9846	Set to 1 when it is determined that an event alarm occurs in the macro instruction, indicating that the real-time data of the event needs to be uploaded

9. HMI Calibration

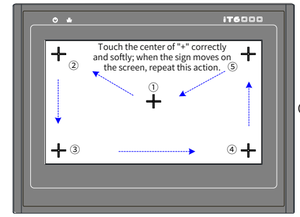
If the HMI touch response is insensitive or abnormal, calibrate the HMI with the calibration program.

1) Enter the touch calibration program.

- Enter the program from the System Settings menu as follows:
  During power-on startup of the HMI, press the screen softly, and the HMI displays the password box under system setting. If you do not enter touch the password box within 20s, the system automatically enters the calibration program, or you can directly enter the system setting password, and press "Calibration".

2) Carry out calibration as follows:

- After the system enters the calibration mode, a "+" sign (as shown in the following figure) is displayed in the middle of the screen.
- Touch the center of "+" with your finger or by using a stylus. Then the "+" sign moves in the directions shown in the figure. (Touch the center of "+" correctly and softly; when the sign moves, repeat this action.)
- When calibration of the "+" sign at the five points are done, the sign disappears. Touch the blank area of the screen to exit. If calibration fails, the cursor returns to the center of the screen, and perform calibration on the five points again.



Calibration process

INOVANCE Warranty Agreement

1) Inovance provides an 18-month free warranty to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.
2) Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
   a. Improper use or repair/modification without prior permission
   b. Fire, flood, abnormal voltage, natural disasters and secondary disasters
   c. Hardware damage caused by dropping or transportation after procurement
   d. Operations not following the user instructions
   e. Damage out of the equipment (for example, external device factors)
3) The maintenance fee is charged according to the latest Maintenance Price List of Inovance.
4) If there is any problem during the service, contact Inovance's agent or Inovance directly.
5) Inovance reserves the rights for explanation of this agreement.

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