

## RTU Touchscreen Controller for HiQDT Smart Digital RS-485 MODBUS RTU pH, ORP, Dissolved Oxygen, Ion Selective & Conductivity Sensors



*Six (6) Channel Configuration shown on left and Dual (2) Channel Configuration shown on right.*

### Measurements

- pH
- ORP
- Dissolved Oxygen (D.O.)
- Ion Selective (ISE)
- Conductivity (EC)
- **Special Computed Total ISE Configuration for pH Compensated Total Ammonium, Total Fluoride and Total Cyanide**
  - *Total ISE special configurations require free ammonium, free fluoride and free cyanide ion selective sensor and pH sensor in addition to special 3TX-TOT-DT module to compute and output total pH compensated total ammonium, total fluoride and total cyanide*
  - *Computed total ISE sent as 4-20mA analog output and MODBUS TCP digital output*

### Features

- **Expandable universal controller software allows for anywhere from one (1) to six (6) fully independent measurement channels**
- **Isolated, Reversible & Scalable 4-20mA analog output for process value from each channel. Optional analog output for temperature value & 2 each programmable 5A dry contact relays**
- **MODBUS TCP (a.k.a. Modbus over ethernet)**
- **Seamless plug & play hot-swap of sensors for smart workflow where maintenance such as cleaning and recalibration does not have to be done at site installation location**
- **Secure Encrypted Remote capabilities include:**
  - In-Situ Offset Calibrations
  - View all smart analytics such as serial number, time in use & current calibrations
  - Change analog output scaling



## Comparison Chart of RTU Style Touchscreen Controller Configurations

Feature or Functionality	Dual (2) Channel Smart Controller Package	Six (6) Channel Smart Controller Package	Total Ammonium, Total Fluoride or Total Cyanide Special Controller
Interface (HMI)	4.3 Inch Color Touchscreen 3.70" X 2.10" 480 X 272 pixels	7.0 Inch Color Touchscreen 6.11" X 3.42" with 800 X 480 pixels	
Installation Styles	NEMA 4X Assembly with Clear Hinged Latched Protective Door for Touchscreen HMI Package is Ready for Wall or Pipe Mounting in the Field as supplied with support for securing with padlock		
Approvals	CSA & UL for HMI CE for 3TX-RTU-D, 3TX-TOT-DT, 3TX-TEM-DT Transmitters & 3TX-REL-DT Relay Modules		
Calibration Methods	Windows Software / Handheld Battery Powered Communicator / PLC Touchscreen Interface Auto-buffer calibration mode on PLC Touchscreen with 1.68, 4.00, 6.86, 7.00, 9.18, 10.00, 12.45 pH buffers supported Separate slope for acid conditions (pH <7) and alkaline conditions (pH >7) supported for all calibration methods		
Power Options	85-264 VAC or 9-36 VDC	85-264 VAC or 9-36 VDC	
Max Number of HiQDT Sensors	Up to 2 each (Min is 1 each)	Up to 6 each (Min is 1 each)	Up to 4 each Min 1 each Free ISE & 1 each pH Optional 2 each additional sensors
Sample Output Configurations	<u>Single Channel:</u> 1 each process Std & Optional 1 each temp OR relay module  <u>Dual Channel:</u> 2 each for process value only	<u>Six Channel:</u> 6 ea for process value only <u>Triple Channel:</u> 3 ea for process & 3 ea for temp/relay <u>Dual Channel:</u> 2 ea process & 2 ea for temp and relay	Total ISE Base Package: 1 ea for Free ISE + 1 ea for pH + 1 each for computed total ISE  Optional 2 ea additional output slots are available in this configuration
Analog Output(s) for Process Value	Selectable Non-Inverted 0-20mA, 4-20mA or Inverted 20-0mA, 20-4mA analog current loop output configurations: 1. One (1) each analog current loop output exits for each measurement channel requested at time of order. 2. Dual channel controller can have 1 or 2 each outputs. Six channel controller can have from 1 to 6 each outputs. 3. Special total ISE controller has 1 each output for free ISE, 1 each output for pH and 1 each output for total ISE. If addition channels are added to this special configuration then up to 2 more analog outputs can be present.		
Temperature Output	Optional with 3TX-TEM-DT module that provides scalable, proportional & reversible analog 4-20mA current loop output for temperature any mating connected sensor input. <b>Total outputs cannot exceed available slots in controller.</b>		
Contact Relays	Optional with 3TX-REL-DT module that provides two (2) each fully independent user programmable 5A dry contact relays with Simple On/Off as well as Time Proportional Control (TPC) and Proportional Frequency Control (PFC) a.k.a. Variable Pulse control algorithms. <b>Total outputs cannot exceed available slots in controller.</b>		
Digital Output	MODBUS TCP Slave (a.k.a. MODBUS over ethernet) with registers to access <u>ALL</u> information that is shown on HMI		
Trend Graphs	Process & temp values for last 8 hours of each channel. For conductivity sensors computed units of PSU (salinity) & TDS or resistivity MegaOhm (MΩ) units can be shown. Dissolved oxygen can show ppm & percent (%) saturation units. For TOT total pH compensated total ISE channels the extent of ionization is also shown for each data point.		
Datalogging	Process Values, Temp & raw mV logged every 30 seconds (with onscreen trending graph); Analytic & Calibration Info logged every 30 minutes. <b>Remote access to logged data over FTP.</b> Capacity is 32GB for logging on all configurations.		
Remote Access Capabilities	<u>ALL</u> functionality is available remotely over ethernet with VNC & FTP using secure <b>Maple Systems EasyAccess 2.0</b> Supported Remote Platforms Include: Microsoft Windows PC as well as Android & iOS Smartphones & Tablets		
Special Feature 1	<b>Hot-swap sensors between channels configured for same sensor type without changing node address. This means seamless exchange of sensors between any controller with channel configured for that same measurement type.</b>		
Special Feature 2	<b>Fully customizable default settings for 3TX transmitter modules with preconfigured touchscreen controller if desired configuration is requested at time of order for a zero configuration and immediate plug and play startup.</b>		

1. All analog outputs have 4mA trim offset & 20mA trim span calibration capabilities. Max 500 Ω (Ohms) load per analog current loop
2. Galvanic and serial optocoupler isolation between all sensor inputs and outputs for fully independent measurement channels
3. Optional 3TX-TEM-DT temperature output and 3TX-REL-DT contact relay modules are interfaced via the local three push button and LED interface rather than from the HMI. Please refer to relevant documentation for these modules for setup and configuration.

## Selected Photos of Six (6) Channel Touchscreen Controller Assy for HiQDT Smart Digital RS-485 MODBUS RTU Sensors

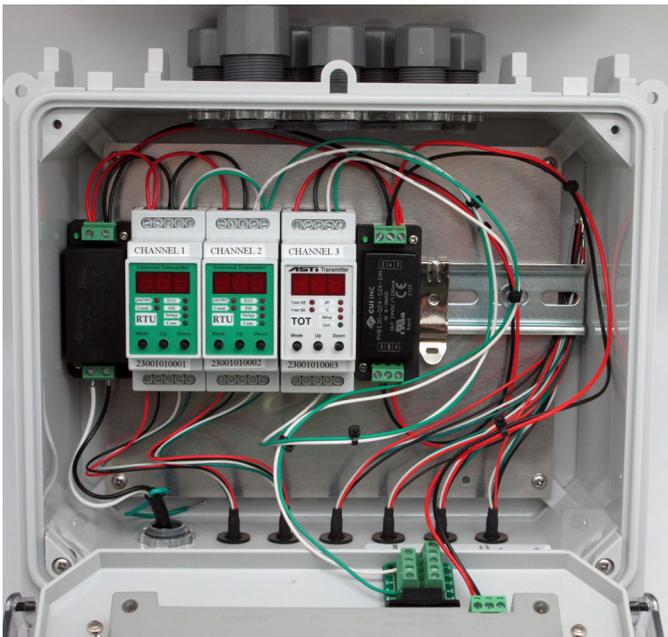


Photo above for fully populated six channel touchscreen controller Assy. Large seven (7) inch touchscreen for configuration of channels, output scaling, calibration & display for all sensors. The isolated analog output provided from each 3TX-RTU-D transmitter. The digital MODBUS TCP output is provided from the ethernet port on the HMI.

### TOP TWO LEFT PHOTOS:

Clear hinged latched door provides outstanding protection for advanced touchscreen HMI from environment as part of NEMA 4X rated assembly. To access internal components of controller simply remove two top screws & open with pull handle. After initial wiring of outputs, enclosure does not need to be opened to swap sensors but rather just plugged into waterproof panel connector sensor input ports. Seven (7) cable glands on top output side and one (1) cable gland on bottom input side of enclosure along with the six (6) each waterproof HiQ4FP NEMA 6P rated female snap panel mount connectors for easy plug & play use of smart digital hot-swappable sensors.

### BOTTOM LEFT:

Inside detail view of special pH compensated total fluoride, total ammonium and total cyanide controller configuration (special wiring required for this setup). Up to two (2) additional measurement channels can be added after commissioning in this special setup.

# Screenshots of Six (6) Channel Touchscreen Controller (1 of 2)

**Main Menu**  
2023/03/30 10:09

**Sensor 1: 2.21 pION+**  
S1 Temp: 25.0 C 111.75 ppm  
S1 Raw : 143.5 F.W. 18.04

**Sensor 2: 9.18 pH**  
S2 Temp: 26.2 C  
S2 Raw : -126.3

**Sensor 3: 290.30 ORP**  
S3 Temp: 30.4 C  
S3 Raw : 277.5

**Sensor 4: 10.64 D.O.**  
S4 Temp: 25.8 C 129.2 % Sat  
S4 Raw : 18.1

**Sensor 5: 85.36 COND ms**  
S5 Temp: 27.7 C 40.23 PSU  
S5 Raw : 113.3 61500 TDS

**Sensor 6: 0.07 COND us**  
S6 Temp: 23.1 C 13.912 M Ohms  
S6 Raw : 0.1 12.768 M UPW

Controller for MODBUS RTU Sensors

Main display for the six channel controller. Other screens are obtained through the main menu. Status updates, alarms & alerts are scrolled across top of screen.

**Analog Output Status**

Configure Analog Output Channel  
Scale Analog Outputs

Value	Sensor Type	Output Value	Output Type
Ch1: 2.21 pION+	112.00 ppm	5.79	4-20mA
Ch2: 9.18 pH		14.49	4-20mA
Ch3: 290.20 ORP		14.99	4-20mA
Ch4: 10.65 D.O.	ppm	12.52	4-20mA
Ch5: 85.36 COND ms		16.88	4-20mA
Ch6: 12.80 COND	M UPW	8.18	4-20mA

There is one isolated analog output for each smart sensor input. Selectable as standard 0-20mA or 4-20mA or inverted 20-0mA or 20-4mA output instead.

**Main Menu** Exit

- Select Channel
- Sensor Type
- Calibrate Sensor
- Sensor Diagnostics
- E-Mail Notifications
- Controller Info
- Trend Display
- Hold Channel Output
- Analog Outputs
- Alarm Event Status
- Remote Access 2.0

Main menu highlights major tasks & functionality. Additional submenus will load as appropriate to further navigate each of the available features & options.

**Scale Analog Outputs**

Select Working Channel: [ 0 ]

Update Scaling

Channel	Measurement Type	H	L	Current High	Current Low
Channel 1	pION+	0.00	2.21	51.42	18.09
Channel 2	pH	88.89	9.18	88.89	11.11
Channel 3	ORP	100.00	290.30	88.89	11.11
Channel 4	D.O.	13.33	10.65	13.33	0.00
Channel 5	COND ms	100.00	85.36	100.00	0.00
Channel 6	COND	100.00	13.05	100.00	0.00

Universal controller supports setting any measurement type for any channel. Analog output scaling setpoints are entered in percent units for all sensor types.

**Select Sensor Type** Back

Current Working Channel: [ 1 ]  
Current Working Node: [ 0 ]

Update Sensor

Select Sensor Type	Sensor Address Range
pH	pH (Node 1/41/81/121/161/201)
ORP	ORP (Node 2/42/82/122/162/202)
Wide ORP	Wide ORP(Node 3/43/83/123/163/203)
D.O.	D.O. (Node 4/44/84/124/164/204)
pION	pION (Node 5/45/85/125/165/205)
Conductivity	Conductivity (Node 6/46/86/126/166/206)
	TOT(Node 8/48/88/128/168/208)

Universal touchscreen controller supports any measurement on any channel and is fully programmable in the field as well as being available preconfigured.

**Sensor Diagnostics** Back

Current Working Channel: [ 2 ]

Get Sensor Info

Year Manufactured: 21	Sensor Type: COND
Month Manufactured: 7	Software Rev#: 0
Date Manufactured: 23	Item Number: 23998
Serial Number Year: 21	Min Temperature: 21.7
Serial Number Month: 7	Max Temperature: 24.8
Serial Number Letter: CC	Days In Service: 5.1
Serial Number: 126	Dampener Delay: 1
Cell Constant: 10.00	Cond. Range Mode: 2000

Analytic info for each sensor shown for each channel & datalogged to give details about not only process values but the sensor used for the measurements.

**Display pH Sensor Calibrations** Back

Current Working Channel: [ 1 ]  
Current Node: [ 1 ]

Temperature Offset: -0.7 Celcius  
Time Since Temp Offset Cal: 3.2 Days

Process Asymmetric Potential: -54.6 mV  
Time Since Temp Asymmetric Potential (A.P) Cal: 3.2 Days

pH Slope For Acid Use: 56.1 mV per pH  
Time Since Acid Slope Cal: 3.17 Days

pH Slope For Alkaline Use: 56.6 mV per pH  
Time Since Alkaline Slope Cal: 3.17 Days

Sensor calibrations for each channel are displayed & datalogged including time since each calibration was last performed to facilitate best practice maintenance.

**Auto pH Buffer A.P. Cal** Back

Current Working Channel: [ 1 ]  
Current Node: [ 1 ]

pH Buffer for Asymmetric Potential (A.P.) Calibration

Choices: 7.00 Or 6.86 Selection: 7.00 Calibrated Value: 7.00607

Perform Auto-Calibration: Calibrate

Current Reading: 6.97 pH Current Temp: 22.6 C  
Current Asymmetric Potential (A.P.): -48.2 mV  
Time Since Calibration: 0.00 Days

Note: Exact pH of Buffer is computed from the temperature of sensor which is calibrated to ensure results are independent of temperature.

Auto buffer pH sensor calibrations with support for 7.00/6.86 buffers for A.P. (Offset); 4.00/1.68 buffers for acid slope & 10.00/9.18/12.45 for alkaline slope

## Screenshots of Six (6) Channel Touchscreen Controller (2 of 2)

**Main Menu**  
2023/03/13 12:46

**Sensor 1: 1.95 pION-**  
S1 Temp: 26.5 C 213.67 ppm  
S1 Raw : 21.5 F.W. 19.00

**Sensor 2: 3.45 pH**  
S2 Temp: 26.2 C  
S2 Raw : 217.4

**Sensor 3: 1.65 TOT**  
S3 Temp: 26.5 C 49.90 %  
S3 pK : 3.45 428.31 ppm  
pH:41 ISE:5

**Sensor 4: 0.00**  
S4 Temp: 0.0 C  
S4 Raw : 0.0

**Sensor 5: 0.00**  
S5 Temp: 0.0 C  
S5 Raw : 0.0

**Sensor 6: 0.00**  
S6 Temp: 0.0 C  
S6 Raw : 0.0

5 41 88 0 0 0

**Controller for MODBUS RTU Sensors**

Main display for the special total ISE controller. Up to two more measurement channels can be added if desired in addition to these three.

**Analog Output Status** Back

**Configure Analog Output Channel**  
**Scale Analog Outputs**

	Value	Sensor	Type	Output Value	Output Type
Ch1:	1.95	pION-	213.67 ppm	7.41	4-20mA
Ch2:	3.45	pH		11.88	4-20mA
Ch3:	430.28	TOT	ppm	17.73	4-20mA
Ch4:	0.00				
Ch5:	0.00				
Ch6:	0.00				

Example of typical setup for Special total fluoride controller: Channel 1 - free fluoride, Channel 2 - pH & channel 3 - Total pH compensated fluoride.

**Scale Analog Outputs** Back

Select Working Channel: [ 0 ]

**Update Scaling**

Channel	Type	H	L	Current High	Current Low
Channel 1	pION-	51.55	18.22	51.55	18.21
Channel 2	pH	88.89	11.11	88.89	11.11
Channel 3	TOT	51.55	19.89	51.55	19.89
Channel 4		0.00	0.00	0.00	0.00
Channel 5		0.00	0.00	0.00	0.00
Channel 6		0.00	0.00	0.00	0.00

Typical default configuration for Special total ISE controller with ISE & TOT channels setup for 0-100ppm scaling and pH setup for 0-14 scaling.

**Configure Analog Output** Back

Select Working Channel: [ 0 ]

**Channel Type 0** Value Of 0 Equals 0-20mA  
Value Of 1 Equals 4-20mA

Output To Configure For Six Channel Mode ( 1 & 2 )

Non-Inverted  Inverted

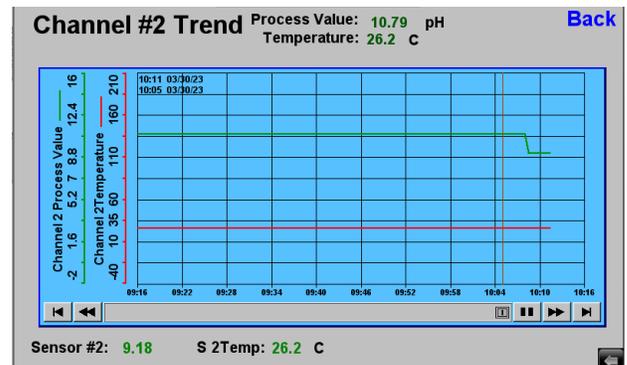
**Update Channel**

Note: Only the analog output number corresponding to active channel is available for configuration. Inverted/Noninverted is updated at same time.

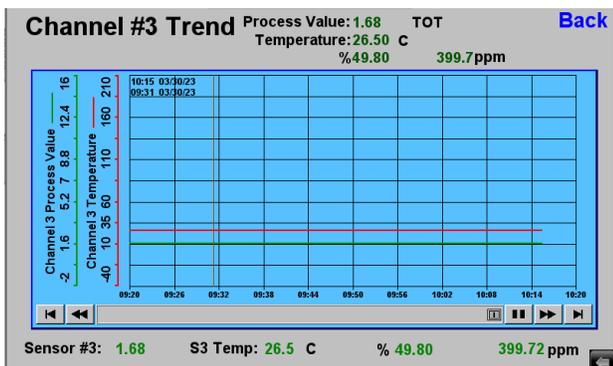
Analog outputs configurations are selectable as the standard non-inverted type 0-20mA or 4-20mA as well as the inverted 20-0mA or 20-4mA type outputs.



Trend graph free for free ISE channel 1 in special total ISE controller. Both the scientific pION value and common ppm units are shown along with temp.



Trend graph shows last 8 hours of process & temp values for each channel. Unlimited datalogging capacity w/ 32GB storage, remotely accessible via FTP.



Trending graph for pH compensated total ISE value in pION and ppm units along with percent of ionization at each data points along with temperature.

**Add E-mail User** Back

Contact Name | Mail Address

Groups: A B C D E F G H

Command:

Other functions: \_\_\_\_\_

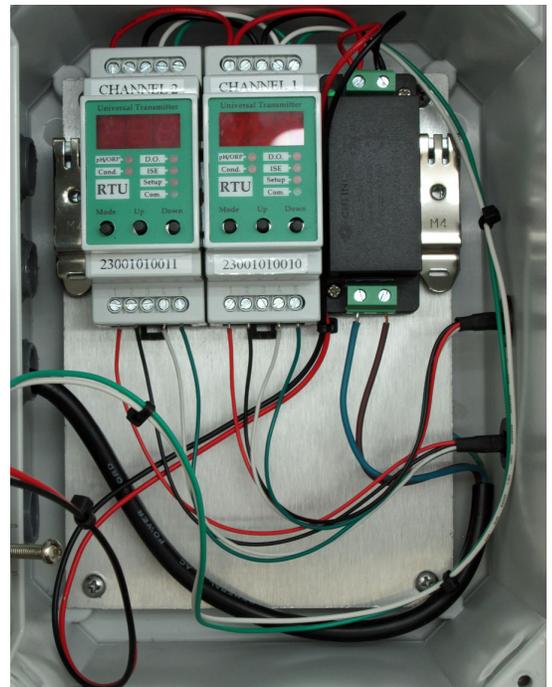
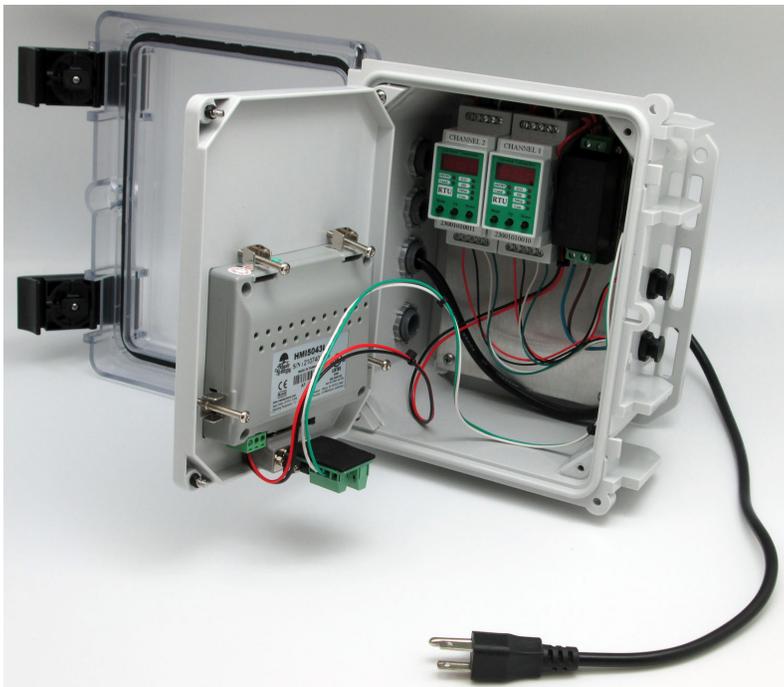
Name: \_\_\_\_\_  
e-Mail: \_\_\_\_\_  
Result: \_\_\_\_\_

Along with full secure graphical remote access capabilities, email notifications are sent for each trigger event. There exists secure FTP access for logged data.

## Selected Photos of Dual (2) Channel Touchscreen Controller for HiQDT RS-485 MODBUS RTU Smart Digital Sensors



*Dual (2) channel RTU touchscreen controller shown above on right with 2 each waterproof HiQ4FP panel mount ports on right input side for the HiQDT smart digital RS485 MODBUS RTU pH sensors. On left above four (4) cable glands on left output side for power, output & ethernet cable. Controller is NEMA 4X when the door is latched. Hot swappable smart plug & play sensors come with NEMA 6P rated HiQ4M snap connectors.*



*Clear hinged latched protective door provides outstanding NEMA 4X protection for touchscreen HMI from environment. In order to access the internal components of controller simply remove two far right screws and open. Analog 4-20mA current loop output(s) provided by 3TX-RTU-D transmitter modules while MODBUS TCP digital output is provided via the ethernet port on the HMI. This controller can be purchase as a single channel unit and expanded to a dual channel configuration by adding and wiring up 3TX-RTU-D transmitter after time of original commissioning.*

*Last Revised November 3, 2024*