

—
User Guide

TXpert™

Digital Dry Transformer



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The Txpert Main Module and associated Modules are intended for use only in commercial and industrial applications.

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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1 Safety Overview

Full compliance with all general safety requirements must be observed during system installation and operation.

Read this guide thoroughly before using the system and make sure that you thoroughly understand its contents before installing, using or maintaining the system.

If you do not fully understand the information contained in this guide or if the equipment shows any sign of damage, do not hesitate to contact ABB (see the back of this guide for contact information). Additionally, each chapter in the guide may contain descriptions of processes or procedural instructions with their own specific safety information. Only by observing all safety information can you minimize the risks of hazards to personnel and/or the environment.

Definitions

This document uses the following symbols to bring attention to key technical and safety-related information.



DANGER—SERIOUS DAMAGE TO HEALTH/RISK TO LIFE

Indicates a hazardous situation that, if not avoided **will** result in death or serious injury.



WARNING—DAMAGE TO HEALTH/RISK TO LIFE

Indicates a hazardous situation that, if not avoided **could** result in death or serious injury.



CAUTION—DAMAGE TO HEALTH

Indicates a hazardous situation that, if not avoided, could result in **minor or moderate** injury.



NOTICE

Indicates information considered important, but not hazard related, that could impact things other than personal injury, like property damage.

Personnel



WARNING

Failing to comply with any of the instructions, precautions or warnings contained in this guide is in direct violation of the standards of design, manufacture, and intended use of the equipment.

ABB assumes no liability for the user's failure to comply with any of these safety requirements which may result in personal injuries and/or equipment damages.

- **Do not, under any circumstances,** remove the warning and caution labels. Information must be available at all times for the security of the user.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- The instrument is intended for factory and field installation by qualified service personnel according to manufacturer's installation instructions and local/national wiring requirements.
- Operators must strictly observe all applicable national regulations with regards to installation, function tests, repairs, and maintenance of electrical devices.

Cybersecurity

This product is designed to be connected to and to communicate information and data via a network interface. It is the user's sole responsibility to provide and continuously ensure a secure connection between the product and the user network or any other network (as the case may be). Users shall establish and maintain any and all appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system, and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Improper use

Customers should not repair or alter the TXpert.

Technical limit values

The instrument is designed for use exclusively within the values stated on the nameplates and within the technical limit values specified on the data sheets.

2 TXpert Module Overview

The TXpert module is an integrated component of the TXpert™ Digital Dry Transformer. This module integrates sensors and electronics to gather data, perform calculations, and provide analytics of key performance indicators.

Data may be downloaded from the TXpert by Wi-Fi or ethernet communication with a host computer running a WebUI or by sending push communication messages to a MQTT (Message Queuing Telemetry Transport) client.

The TXpert module consists of the main enclosure, the communications module, and the relay module.

2.1 Main Enclosure

The main enclosure houses the system electronics including the alarm and trip relays. It is mounted on a core clamp or the inner side of the transformer cover.

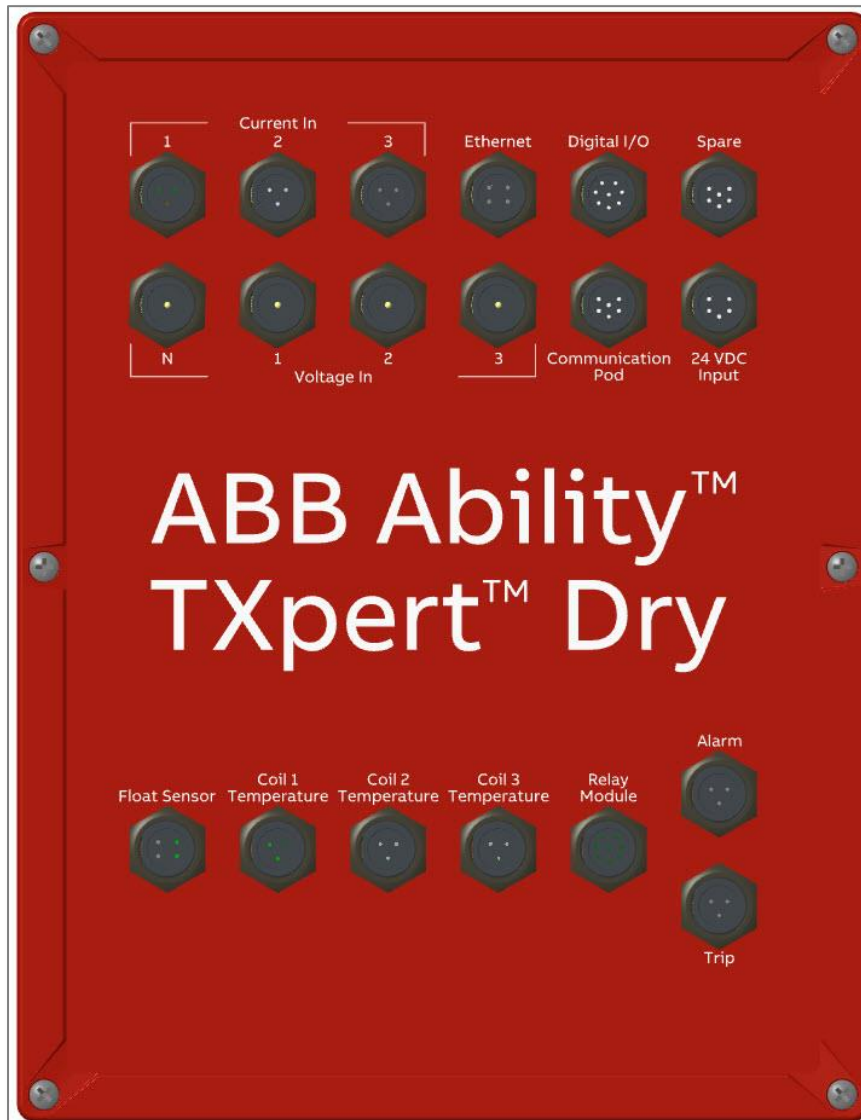


Figure 1

Figure 2

2.1.1 Measurement and Control Connections

The TXpert uses custom cabling to communicate with sensors and modules. When a connector is not in use, it should be kept covered with the provided, protective cap.

Connector	Function	Description
Current In 1	Measurement	Phase 1 Current Input
Current In 2	Measurement	Phase 2 Current Input
Current In 3	Measurement	Phase 3 Current Input
Voltage In 1	Power and Measurement	Phase 1 Voltage Input (This is used for power when the 24VDC input is not used)
Voltage In 2	Measurement	Phase 2 Voltage Input. This is used for power when the neutral is not used.
Voltage In 3	Measurement	Phase 3 Voltage Input
Neutral	Power and Measurement	Neutral Voltage Input
Ethernet	Communication	Ethernet
Dig IO	Measurement and Control	Currently not used.
Spare	Not Used	Currently not used.
Comm Pod	Communication and Measurements	Communications pod: provides Wi-Fi communication and records ambient temperature and GPS location.
24 VDC	Power	Alternate power port for an external power supply. (In standard operation the TXpert draws power from Phase 1 and an external power supply is not needed.) When not in use, the input should have a jumper cable connected to ground.
Float Sensor	Measurement	Water Level Switch (Currently not used)
Coil 1 Temperature	Measurement	Temperature at Coil (Phase 1)
Coil 2 Temperature	Measurement	Temperature at Coil (Phase 2)
Coil 3 Temperature	Measurement	Temperature at Coil (Phase 3)
Relay Module	Measurement and Control	Pass-through for signals to the Relay Module
Alarm	Control	Alarm Relay (5A-250VAC)
Trip	Control	Trip Relay (5A-250VAC)

Table 1

**WARNING—DAMAGE TO HEALTH/RISK TO LIFE**

Cabling should not be added or removed when voltage is applied to the transformer.

2.1.2 Sensor and Power Readings

2.1.2.1 Power Readings

Voltage is measured on each of the three phases via cables attached to the neutral and low voltage bushings. Current measurements are read from Rogowski coils mounted to encircle the low voltage bushings.

Reading	Qty	Primary Range	Accuracy (Primary)	Location
LV Current	3	0~15000A AC Up to 500 VAC	ANSI Class 0.2 (0.2%)	LV bus bar
LV Voltage	3	0~500 VAC	Class 0.2 (0.2%)	LV bus bar

Table 2

2.1.2.2 Sensor Readings

Readings are acquired from sensors located on the transformer and the communications pod. Sensor readings are returned to the TXpert via custom cabling.

Sensor	Location	Qty	Description	Primary Range	Accuracy (Primary)
GPS	Communication pod	1	Detects the location (latitude and longitude) of the transformer. It also serves as a clock for the system.	N/A	N/A
Ambient temperature	Communication pod	1	Temperature outside of the tank	-40°C ~100°C	Class B (~0.5°C)
Coil Temperature	Mounted inside transformer coil (Phase 1, 2, and 3)	3	RTD (Resistance Temperature Detector).	-50°C to 300°C	RTD class B

Table 3

2.1.2.3 Alarm and Trip Relays

Output	Number of Outputs	Specification	Output Connection Location
Alarm relay	1	SPDT 5A max @ 120~250VAC	Main module
Trip relay	1	SPDT 5A max @ 120~250VAC	Main module

2.2 Communications Module

The Communications Module is the Wi-Fi hotspot and is installed outside of any metallic enclosure (for easier accessibility and to allow connectivity). As a security precaution, an ABB-supplied NFC/RFID card must be detected to enable the Wi-Fi.

The communications module is equipped with a GPS device that detects the transformer location and maintains an accurate system clock.

The typical range of TXpert Wi-Fi communications is 50 to 92 meters. The range is impacted by interference, location and environmental conditions.



Figure 3

2.3 Relay Module (Fan Control) (Optional)

The relay module is mounted on a core clamp inside the transformer enclosure and attaches to the fan circuit. It is used by the TXpert main module (via a custom cable) to monitor and control the fans

The TXpert turns on the fan(s) when the transformer is getting too hot, the load is too large, or to periodically exercise the fan. The fan is turned off when the transformer cools and the load is reduced.

The TXpert calculates when to turn on and off the fans based on algorithms with inputs including transformer load, measured coil temperatures, calculated hot spot temperature, and fan current.

The relay module contains two relays (25A) to perform switching and circuitry to allow monitoring of the fan current.

Connector	Relay Circuit	Function
L1 In	1	Source Line-Voltage Input
N1 In	1	Source Neutral Input
N1 Out	1	Switched Neutral Output
L1 Out	1	Switched Line Output
L2 In	2	Source Line-Voltage Input
N2 In	2	Source Neutral Input
N2 Out	2	Switched Neutral Output
L2 Out	2	Switched Line Output

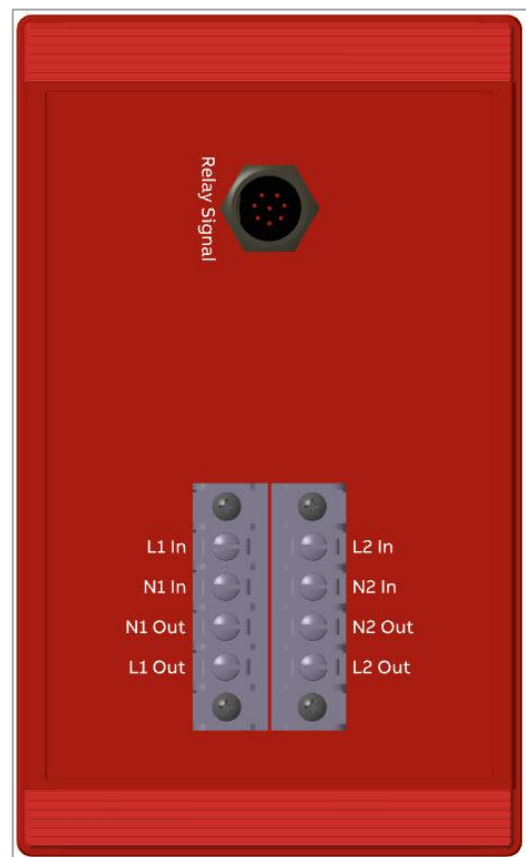


Figure 4

3 Setting up Your MS Windows™-based Laptop or Tablet for TXpert WebUI Communication

The TXpert communicates to your laptop or tablet via Wi-Fi or Ethernet. A web server interface allows you to view the TXpert sensor readings, calculated values, warnings and events, and transformer characteristics. It also gives you the ability to configure key parameters, download stored readings and calculated values, and update security

To communicate with the TXpert's Web Server, you must have a modern laptop or tablet with the following required software.

Google Chrome™:	Web Browser configured with security certificates recognizable by the ABB TXpert
MS SQL™ Browser:	A database (SQL) browser to view data downloaded from the TXpert (e.g. DB Browser for SQL Lite)
7-zip:	Required to bundle files used for configuration upload

Note: It is recommended that you have a tablet or laptop that is dedicated to TXpert communication. Certain security software, firewalls, or network configurations may prevent establishment of a Wi-Fi connection or communication with the Web Server.

3.1 Specifications

You should use a laptop or tablet with these minimum specifications:

Operating System:	MS Windows 7 or greater (64-bit)
Memory (Ram):	4Gb or higher
Networking:	Wireless AC (802.11ac)
Screen Size:	12 inches or greater

3.2 Installing Google Chrome

Download and install Google Chrome, version 56.0.2924.87 or greater, from www.google.com/chrome/. It is recommended to set it as your default browser.



3.3 Installing the Chrome Security Certificates

Note: the exact wording on the Chrome tabs will vary depending on your version of Chrome.

Step 1: Open Google Chrome

Step 2: Navigate to the Chrome Settings tab. (Left-click on the ellipses on the upper right window and select “*Settings*” from the pull-down menu.”

Step 3: Navigate to the Advanced Settings tab by scrolling to the bottom of the Settings tab and selecting “*Advanced*”.

Step 4: Select “*Manage Certificates*”. A pop-up Certificates window will launch. Verify the “*Intended Purpose*” selection is set to All then select “*Import*”. This will launch the Certificate Import Wizard.

Step 5: In the wizard, select “*Next*” to continue past the welcome screen.

Step 6: Use the Browse feature to navigate to the file “Client.p12”. This file is included in the TXpert documentation package that you received with your transformer. (Set the file type to “Personal Information Exchange”).

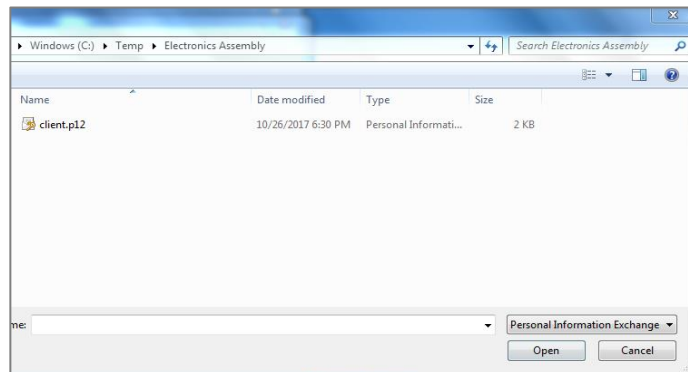


Figure 5

Step 7: The wizard will advance to a Password window. Enter your password into the password field then continue selecting “*Next*” until you reach the final window. (The default password is “pass”).

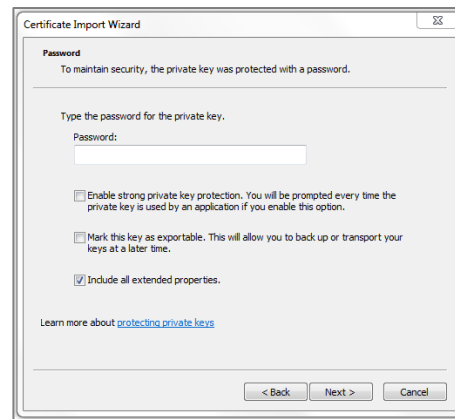


Figure 6

Step 8: On the final window, you can review your file information. Press Finish to complete the certificate installation.

3.4 Installing the SQL Browser

The TXpert stores data in an SQL database and viewing the uploaded data requires a compatible browser. This guide assumes you will be using the SQLite database browser (which may be downloaded from <http://www.sqlitebrowser.org/>). The version must be 3.9.1 or greater.

3.5 Installation of 7-zip

If you plan to update the TXpert configuration file, you must bundle the configuration files into a 7-zip format. 7-zip can be downloaded from <http://www.7-zip.org/download.html>. The version must be 15.12 or greater.

4 Accessing the TXpert User Interface

You may access the TXpert user interface via a wired Ethernet connection or Wi-Fi. Wi-Fi communication is initiated when the TXpert Communications Module recognizes a programmed NFC card. This triggers the Wi-Fi connection to be exposed to laptops or tablets with a valid security certificate. The Wi-Fi connection will automatically terminate if no communication is detected for 16 minutes. A programmed NFC card is shipped with the TXpert modules. The Ethernet connection remains continuously active. A custom Ethernet cable is required.



WARNING—DAMAGE TO HEALTH/RISK TO LIFE

Wi-Fi initiation should be performed by trained personnel following appropriate safety precautions.

4.1 Initiating Wi-Fi

To expose the Wi-Fi connection, place the NFC card on the top, front of the communications module over the ABB logo as shown in Figure 7. Hold the card in place for 1-2 seconds then remove.

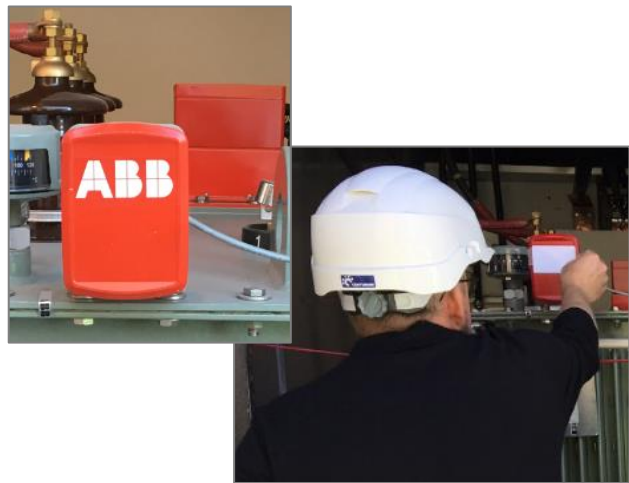


Figure 7

4.2 Connecting to Wi-Fi

After you have removed the NFC card from the Communications Module you, the TXpert exposes its Wi-Fi connection. This typically takes 30 to 60 seconds.

The Wi-Fi SSID Name (network name) is user configurable and should be unique for each Txpert. (Figure 9 is showing the name “txpert”.)

Launch the connections app from the system tray and wait for the TXpert network to appear. You may need to refresh the window a few times and/or retry initiating the connection. After the Wi-Fi SSID name appears, click on it and then select the Connect button.

Enter your password as the security key and “OK” to continue. (The default password is “password”).



Figure 8



Figure 9

If you are prompted to select a security certificate, select “altran-user” and then “OK”. You may get the warning that your connection is not private, click on “Advanced”. Then select “Proceed to *IP Address*”(unsafe)”.

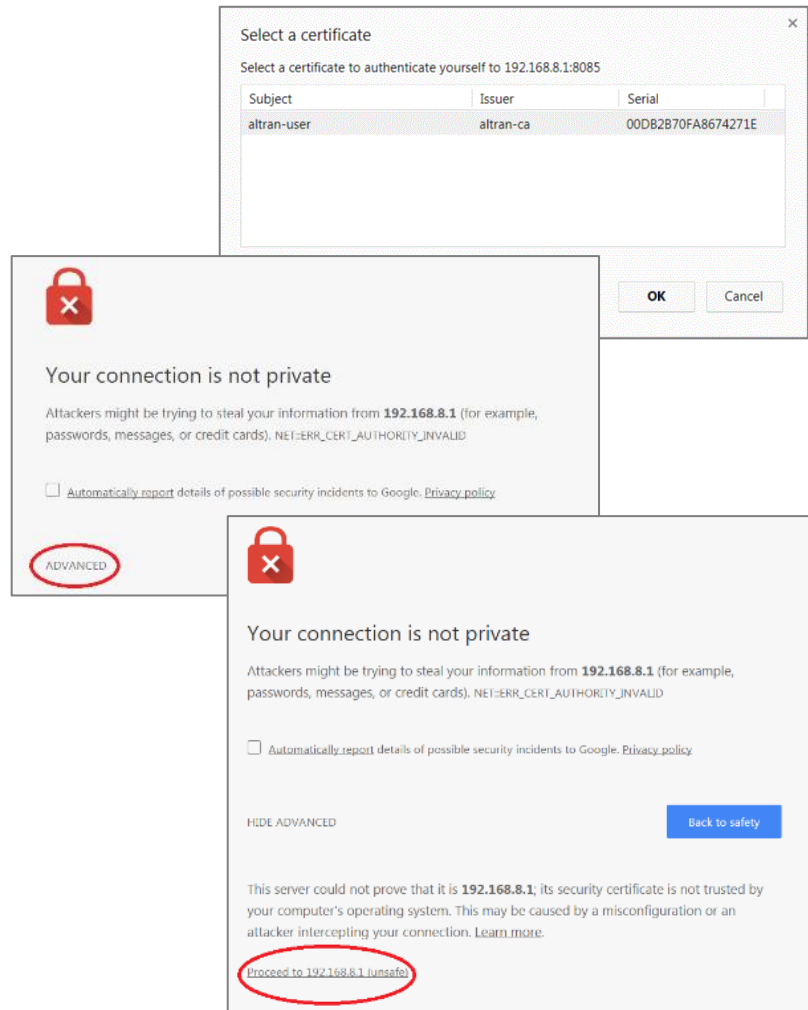


Figure 10

4.1 Connecting to the Web Server

To access the TXpert web server, which provides the user interface, launch Google Chrome and enter the address of the TXpert into the address bar. The address is in the format **https://ip-address:8085**.

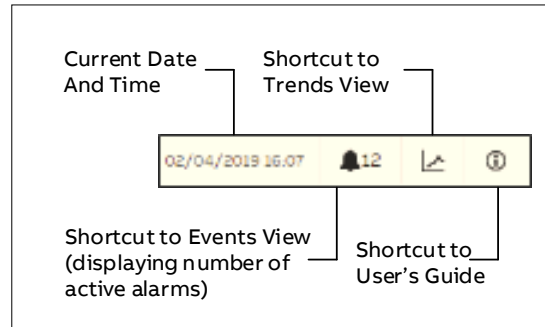
Default Wi-Fi Address	Default Ethernet Address
https://192.168.8.1:8085	https://192.168.0.1:8085

Bookmarking the web address will save time in the future.

5 Navigating the TXpert User Interface

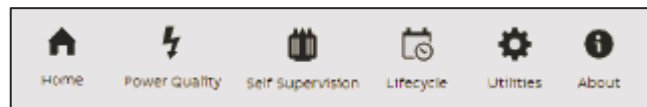
5.1 Status Bar

The status bar is located on the top, right of each page.



5.2 Navigation Bar

The navigation bar is located vertically along the left side of each page. Click the icons on the navigation bar to alternate between the different views (described in the following sections).



Note: the Trends View and Events View are only accessible via the status bar.

5.3 Home View

The Home view displays a snapshot of the monitored readings and transformer status. The values are automatically refreshed every 10 seconds.

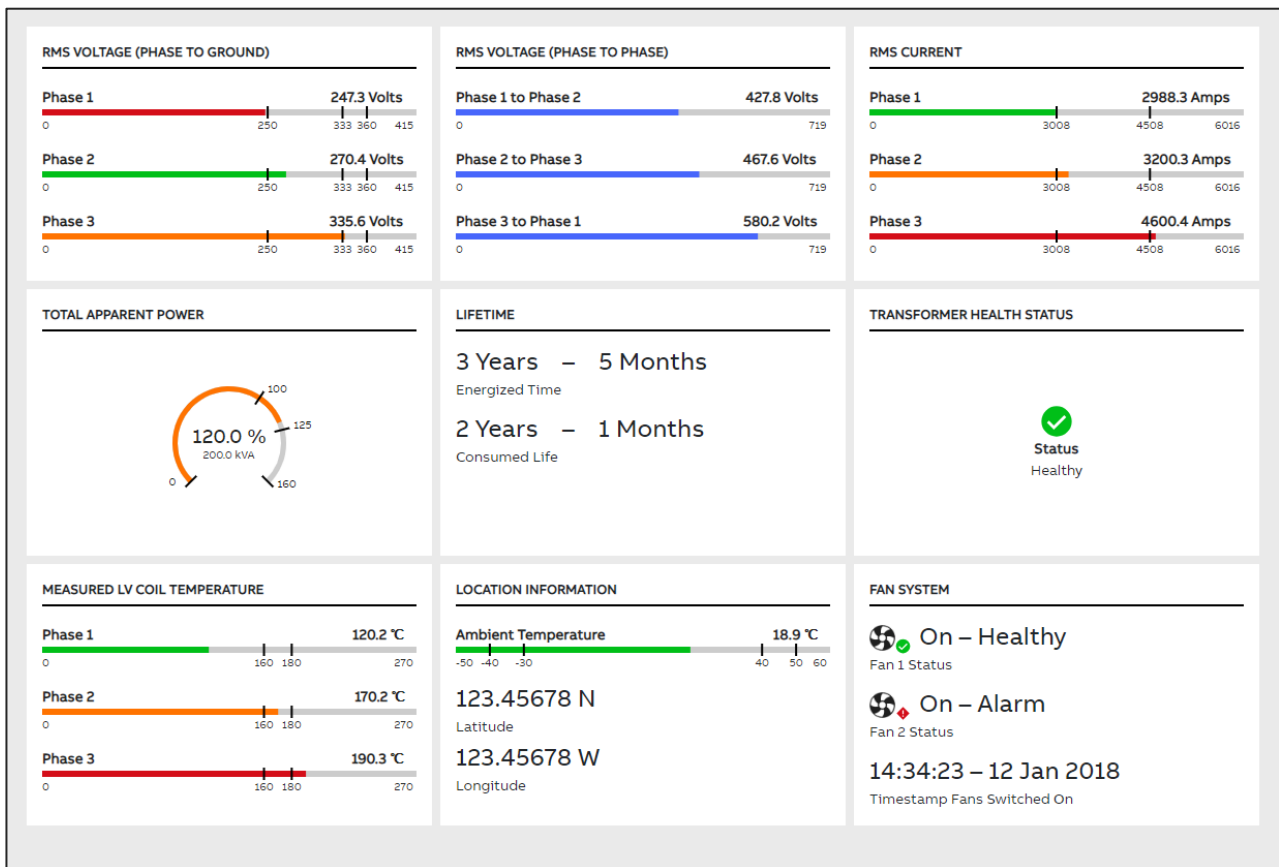


Figure 11

Field	Description	Alarm Indication
RMS Voltage Phase to Ground (Volts)	Calculated RMS voltage (phase to ground)	Alert and critical thresholds are shown as bars on the graph. The line color changes to green, orange, then red to indicate the alarm level.
RMS Voltage Phase to Phase (Volts)	Calculated RMS voltage (phase to phase)	None
RMS Current (Amps)	RMS current readings	Alert and critical thresholds are shown as bars on the graph. The line color changes to green, orange, then red to indicate the alarm level.
Total Apparent Power	The sum of apparent power for all three phases.	Alert and critical thresholds are shown as bars on the graph. The line color changes to green, orange, then red to indicate the alarm level.
Lifetime: Energized Time	The number of years and months that voltage has been applied to the transformer.	None
Lifetime: Consumed Time	Consumed Lifetime based on calculations from IEEE C57-96 and IEC 60076-12	None
Transformer Health Status	Overall status base on monitored health parameters. (See Event Monitoring)	Healthy (green) or Alarm (red)
LV Coil Temperature (DegC)	Temperature at low voltage coil for each phase.	Alert and critical thresholds are shown as bars on the graph. The line color changes to green, orange, then red to indicate the alarm level.
Ambient Temperature (DegC)	The ambient temperature near the transformer	Alert and critical thresholds are shown as bars on the graph. The line color changes to green, orange, then red to indicate the alarm level.
GPS Coordinates	The longitude and latitude of the transformer location.	None
Fan 1 Status	Health of fan based on assessment of current monitoring.	Healthy (green) or Alarm (red)
Fan 2 Status	Health of fan based on assessment of current monitoring.	Healthy (green) or Alarm (red)
Fans Timestamp	Date and Time the fans were switched on	None

Table 4

5.4 Power Quality View

Power quality indicators allow you to monitor transformer performance based on standard calculations. No alarm or warning events are generated based on these values.

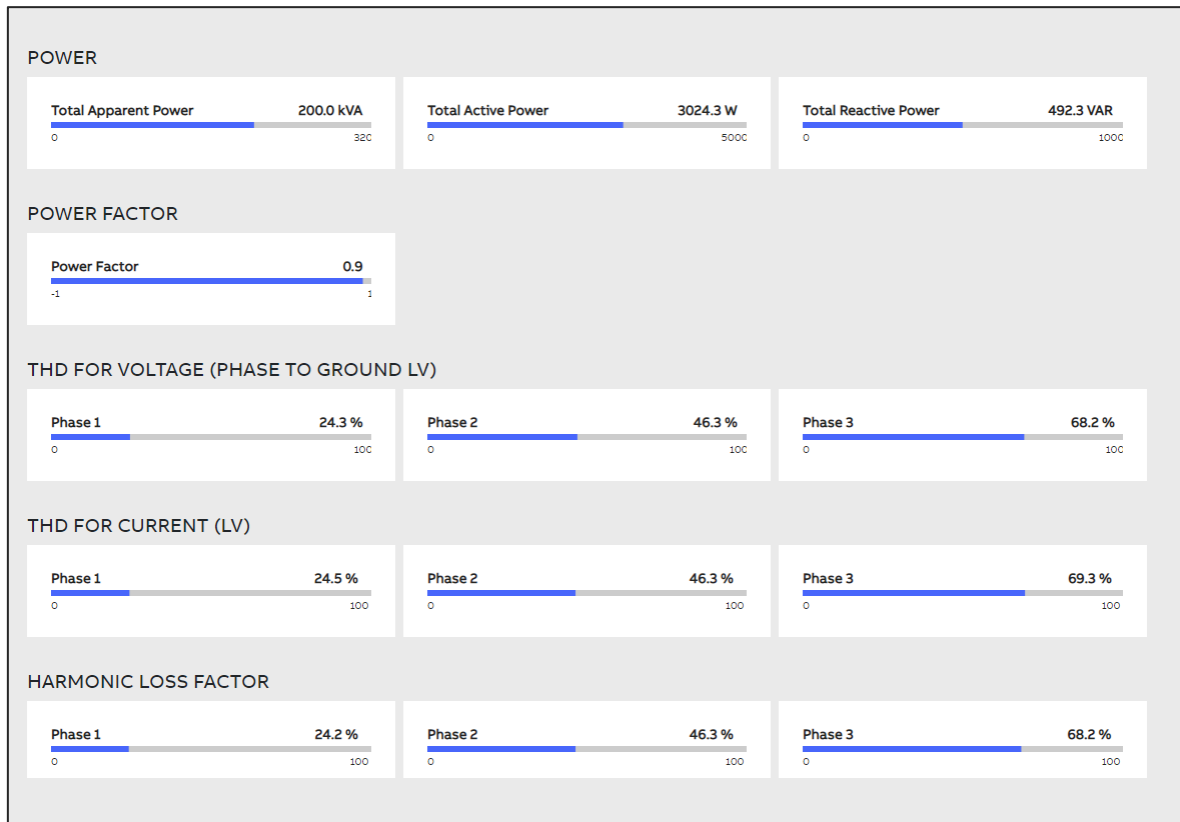


Figure 12

5.5 Self-Supervision View

New functionality will be coming soon.

5.6 Life Cycle View

New functionality will be coming soon.

5.7 Trends View

New functionality will be coming soon.

5.8 Events View

5.8.1 Transformer Events

Current transformer status events are shown in this view. Green indicates the sensor reading (or calculated value) has not exceeded a preset threshold, orange indicates the warning state while red indicates the alarm state. The timestamp, source and description of the event are shown. Warnings and alarms will clear automatically when the out-of-threshold condition clears.

Status	Timestamp	Source	Description
Normal	None	Ambient Temperature	Ambient temperature is normal
Normal	None	Coil Temperature P1	Phase 1 coil temperature is normal
Normal	None	Coil Temperature P2	Phase 2 coil temperature is normal
Normal	None	Coil Temperature P3	Phase 3 coil temperature is normal
Normal	None	Fan 1 Health	Fan 1 is healthy
Normal	None	Fan 2 Health	Fan 2 is healthy
Normal	18:22:32 - 24 Jan 2019	Fan Status	Fans are on
Normal	13:24:14 - 01 Jan 2019	Last Energized Timestamp	The last time the system was energized
Warning	12:34:55 - 21 Jan 2019	Over-Current P1	Phase 1 current has crossed the swell threshold
Alarm	18:22:32 - 24 Jan 2019	Over-Current P2	Phase 2 current has crossed the critical swell threshold
Normal	None	Over-Current P3	Phase 3 current is normal
Normal	None	Over-Voltage P1-G	Phase 1 to ground voltage is normal
Normal	None	Over-Voltage P2-G	Phase 1 to ground voltage is normal
Normal	None	Over-Voltage P3-G	Phase 1 to ground voltage is normal
Normal	None	Under-Voltage P1-G	Phase 1 to ground voltage is normal
Normal	None	Under-Voltage P2-G	Phase 1 to ground voltage is normal
Normal	None	Under-Voltage P3-G	Phase 1 to ground voltage is normal

Figure 13

Usage Note: You can sort by any column by clicking on the arrows to the right of the column name.

5.8.2 System Events

System events show the status, timestamp and description of system update events.

Note: the version information for the TXpert software, parameters file, and security package is contained in the description field

Status	Timestamp	Source	Description
Normal	None	Application	Currently running software version 1.4
Normal	None	Parameters	Currently utilizing parameters version 1.4
Normal	None	Security	Currently utilizing security package version 1.4

Figure 14

5.9 Utilities View

The Utilities View allows you to perform system updates, download the database and parameter files, edit the event thresholds, define calculation constants, and define push communication parameters. Access each form by clicking on the tab near the top of the page.

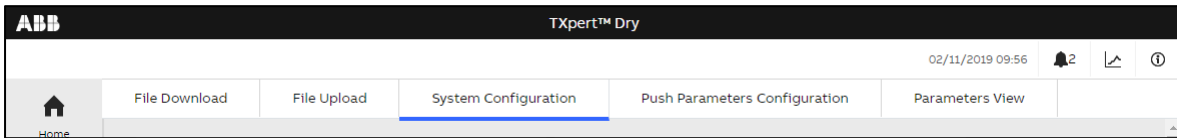


Figure 15

Tab	Functionality	Reference
File Download	Parameter Download	Section 7
	Database Download	Section 11
File Upload	Application Software	Section 9
	Threshold and Computational Parameters	Section 7
	Security Module	Section 10
System Configuration	Wi-Fi and Ethernet Configuration	Section 5.9.1
Push Parameters Configuration	Configure the Push Communication	Section 12
Parameters View	View the computational and threshold parameters	Section 7

Table 5

5.9.1 System Configuration

5.9.1.1 Wi-Fi SSID (Network Name) Configuration

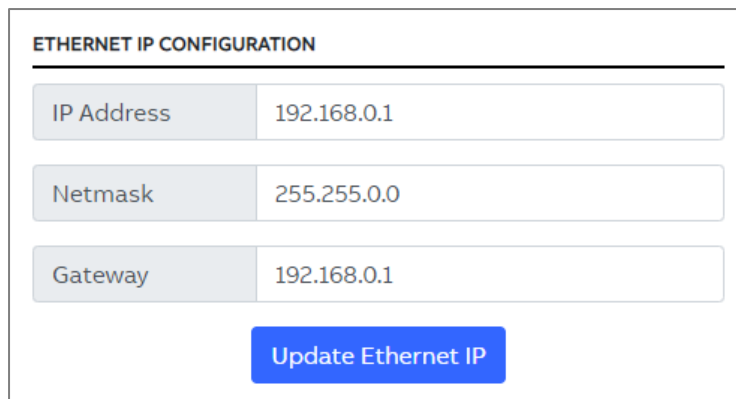
Figure 16

Enter the identifier for the TXpert Wi-Fi network name (nine characters max) then select the Update WIFI SSID button. The TXpert will reset and you must re-establish the connection.

It is recommended that you give every TXpert a unique name.

The Wi-Fi IP address cannot be modified.

5.9.1.2 Ethernet IP Configuration



The screenshot shows a configuration window titled "ETHERNET IP CONFIGURATION". It contains three input fields: "IP Address" with the value "192.168.0.1", "Netmask" with the value "255.255.0.0", and "Gateway" with the value "192.168.0.1". Below these fields is a blue button labeled "Update Ethernet IP".

ETHERNET IP CONFIGURATION	
IP Address	192.168.0.1
Netmask	255.255.0.0
Gateway	192.168.0.1

Update Ethernet IP

Figure 17

The TXpert supports static IP addresses for the Ethernet connection. The default addresses are shown in Figure 17. To change the configuration, enter the new values then select the Update Ethernet IP button. The TXpert will reset and you must re-establish the connection.

It is recommended that you give every TXpert on your network a unique IP configuration.

5.10 About View

5.10.1 Copyright

The Copyright view displays the copyright information of the software used on TXpert.

6 Transformer Event Details

Transformer status and health is assessed by monitoring key operating conditions every 10 seconds. These conditions that are evaluated against out-of-range thresholds that are determined by customer input and by the transformer design. Events are classified by status: normal (green), warning (orange), and alarm (red).

Summary event notifications are shown on the status bar and the Transformer Health status field. Details are shown on the Events View and are recorded in the database. You can download the database to analyze the operating data and to determine more information about the time of occurrence and frequency of out-of-range conditions.

6.1 Known Inputs and Standard Values

Inputs for events algorithms include measured and calculated values and thresholds. Threshold values for each monitored value typically include a high warning threshold (Orange) and a critical threshold (Red).

6.1.1 Voltage and Current Alarm Thresholds

Voltage and current are measured for each phase.

Component	Event (Warning: Orange)	Event (Critical: Red)
Current RMS	Current > <i>Current Swell 1</i>	Current > <i>Current Swell 2</i>
Voltage RMS (phase to ground)	Voltage > <i>Voltage Swell 1</i>	Voltage > <i>Voltage Swell 2</i>
Voltage RMS (phase to ground)		Voltage < <i>Voltage Sag</i>

Table 6

6.1.2 Temperature Alarm Thresholds

Coil temperatures are measured at each phase.

Component	Event (Warning: Orange)	Event (Critical: Red)
Ambient Temperature	Ambient Temp < <i>Ambient Temp Low</i> OR Ambient Temp > <i>Ambient Temp High</i>	Ambient Temp < <i>Ambient Temp Critical Low</i> OR Ambient Temp > <i>Ambient Temp Critical High</i>
Coil Temperature	Coil Temperature > <i>Coil Temperature High</i>	Coil Temperature > <i>Coil Temperature Critical</i>

Table 7

6.1.3 Fan Health Alarm Thresholds

Fan health monitoring is done for each active circuit.

Component	Event (Warning: Orange)	Event (Critical: Red)
Current when Fan is on		Current < ((<i>Fan Current Low Threshold / 100</i>) * <i>Rated Current for Fan Circuit</i>) OR Current > ((<i>Fan Current High Threshold / 100</i>) * <i>Rated Current for Fan Circuit</i>)
Current when Fan is off		Current > ((<i>Fan Off Current Threshold / 100</i>) * <i>Rated Current Fan Circuit</i>)

Table 8

6.1.4 Transformer Activity Events

Component	Information
Fan Status	Fans on/off state.
Last Energized Timestamp	Date and time that the transformer was last energized.

Table 9

6.1.5 Summary of Threshold Parameters

These values are configured in the factory.

VCP					
Parameter	Description	Event Type	Default	Unit	Tag Name
Voltage Sag	Voltage Sag < Limit	Warning	90	%	parmSagLevel_Voltage_1
Voltage Swell 1	Voltage > Limit	Warning	120	%	parmSwellLevel_Voltage_1
Voltage Swell 2	Voltage > Limit	Critical	130	%	parmSwellLevel_Voltage_2
Current Swell 1	Current > Limit	Warning	100	%	parmSwellLevel_Current_1
Current Swell 2	Current > Limit	Critical	150	%	parmSwellLevel_Current_2
Coil Temperature					
Parameter	Description	Event Type	Default	Unit	Tag Name
Coil Temperature High	Temperature > Limit	Warning	100	C	parmCoilTempThresholdLVHigh
Coil Temperature Critical	Temperature > Limit	Critical	120	C	parmCoilTempThresholdLVCritical

Thermal Aging					
Parameter	Description	Event Type	Default	Unit	Tag Name
Ambient Temperature High	Temperature > Limit	Warning	30	C	parmAmbTempHigh
Ambient Temperature Low	Temperature < Limit	Warning	-40	C	parmAmbTempLow
Ambient Temperature Critical High	Temperature > Limit	Critical	40	C	parmAmbCriticalHigh
Ambient Temperature Critical Low	Temperature < Limit	Critical	-50	C	parmAmbTempCriticalLow
Fan Status					
Parameter	Description	Event Type	Default	Unit	Tag Name
Fan Current Low Threshold	Current is less than percentage of rated current (fan is on)	Critical	75	%	parmFanCurrentLowThreshold
Fan Current High Threshold	Current is greater than percentage of rated current (fan is on)	Critical	120	%	parmFanCurrentHighThreshold
Fan Off Current Threshold	Current is greater than percentage of rated current (fan is off)	Critical		%	parmFanOffCurrent

Table 10

7 Parameters Download and Update

In the factory, parameters are downloaded to the TXpert module to set event thresholds and configure values used in calculations. The threshold parameters are described in Table 10 (Summary of Threshold Parameter). The factory-configured parameters, used in calculations, are shown in Table 11.

Thermal Aging		
Description	Unit	Tag Name
Ambient Temperature Used When Determining Transformer Rating	C	parmAmbientRated
Type of Insulation in the Low Voltage Coils (1= VCC coil, 2 = VPI coil, 3 = Resibloc coil)		parmInsulationSystemLV
Type of Insulation in the High Voltage Coils (1= VCC coil, 2 = VPI coil, 3 = Resibloc coil)		parmInsulationSystemHV
Low Voltage Conductor Material (0= Copper, 1 = Aluminum)		parmConductiveMaterialLV
High Voltage Conductor Material (0= Copper, 1 = Aluminum)		parmConductiveMaterialHV
Mass of a Single Phase of the Low Voltage Coil Conductor (coil plus leads)	KG	parmMassConductorLV
Mass of a Single Phase of the High Voltage Coil Conductor (coil plus leads)	KG	parmMassConductorHV
Combined Epoxy And Insulation Mass For A Single Phase Of The Low Voltage Coil	KG	parmMassInsLV
Combined Epoxy And Insulation Mass For A Single Phase Of The High Voltage Coil	KG	parmMassInsHV
Relative position of LV Coil (0=interior, 1=exterior)		parmPositionLV
Relative position of HV Coil (0=interior, 1=exterior)		parmPositionHV
Total Low Voltage DC Loss Combined for All phases	Watts	parmDCLossLV
Total High Voltage DC Loss Combined for All Phases	Watts	parmDCLossHV
Rated AC Losses in the Low Voltage coils	Watts	parmCoilACLossLV
Rated AC Losses in the High Voltage coils	Watts	parmCoilACLossHV
Low Voltage Temperature Rise Due to No-Load Losses	C	parmDelHS_NL_LV
High Voltage Temperature Rise Due to No-Load Losses	C	parmDelHS_NL_HV
VCP		
Description	Unit	Tag Name
Nominal Frequency for Voltage and Current	Hz	parmFreqNorm
KVA Rating with Natural Cooling	KVA	parmKVA
KVA Rating with Forced Air Cooling	KVA	parmKVFA
High Voltage Rating, Phase to Phase	Vrms	parmVoltageRatingHV
Low Voltage Current Rating with Natural Cooling	A	parmCurrentRatingLV
Low Voltage Current Rating with Forced Air Cooling	A	parmCurrentRatingLVFA
Low Voltage Rating, Phase to Ground	Vrms	parmVoltageRatingLV_p2g
Low Voltage Rating, Phase to Phase	Vrms	parmVoltageRatingLV_p2p
Fans		

Description	Unit	Tag Name
Used to implement hysteresis when the fan is switched off.		parmFanOffSafetyFactor
The number of days the fan is allowed to remain idle before an exercise sequence is triggered.	Days	parmFanIdleTimeLimit
The duration the fan runs during an exercise sequence.	Mins	parmFanExerciseDuration
The fan is turned on if the transformer load exceeds this threshold longer than the allowable time (parmFanOLTime) when is the fan turned off?	%	parmFanOLThreshold
Amount of time before a transformer overload condition triggers the fans to turn on.	secs	parmFanOLTime
When this coil temperature is exceeded (on any coil) the fan is turned on. when is the fan turned off?	C	parmFanTriggerCoilTemp
When this Low Voltage Hot Spot temperature is exceeded the fan is turned on. when is the fan turned off?	C	parmFanTriggerLVhotspotTemp
When this High Voltage Hot Spot temperature is exceeded the fan is turned on. when is the fan turned off?	C	parmFanTriggerHVhotspotTemp
Rated current in first fan circuit	A	parmRatedCurrentFanCircuit1
Rated current in second fan circuit	A	parmRatedCurrentFanCircuit2

Table 11

7.1 Viewing the Computational and Threshold Parameters

You can display the computational and threshold parameters by navigating to the Parameters View tab on the Utilities View. See the preceding tables for a description of each of the displayed values.

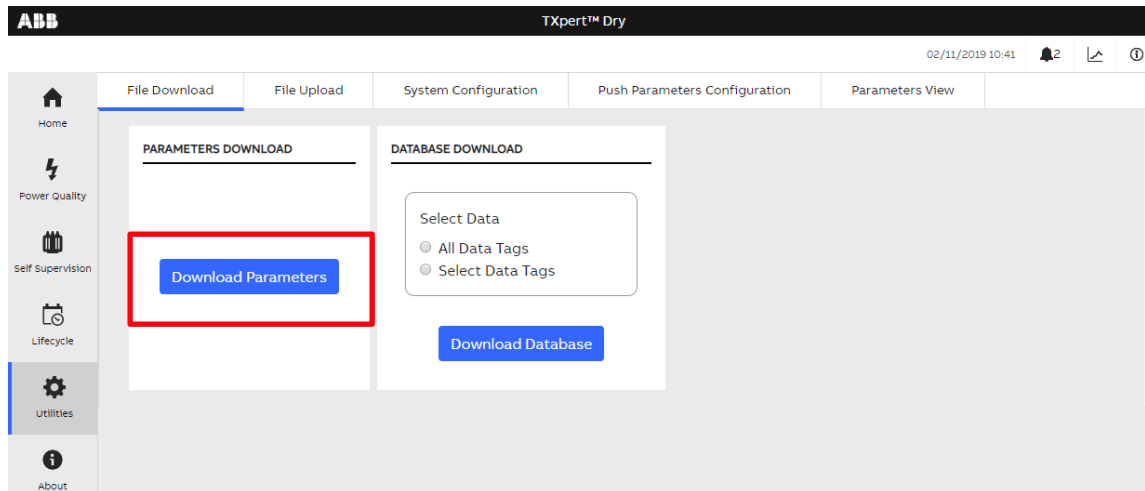
7.2 Computational and Threshold Parameters File

The threshold parameters and the computational parameters are stored in an XML-formatted file named "computationalParameters.xml". It is highly recommended that you not modify any of the factory-configured configuration values. If you must modify the XML file, it is recommended to download the file from the TXpert and use it as a template.

7.3 Downloading the Parameters from the TXpert

You may download the parameters from the Utilities View. The following steps describe the process.

Step 1: Navigate to the File Download tab on the Utilities View. Select the “*Download Parameters*” button to start the download. The file named “parameters.zip” will begin downloading to your laptop/tablet. After the download has completed, click on the down arrow and select *Show in Folder*.



Step 2: In the download folder, right click on the parameters.zip download and extract using 7-zip. (If the 7-zip option is not available, you may open the 7-zip utility from the Start Menu.)

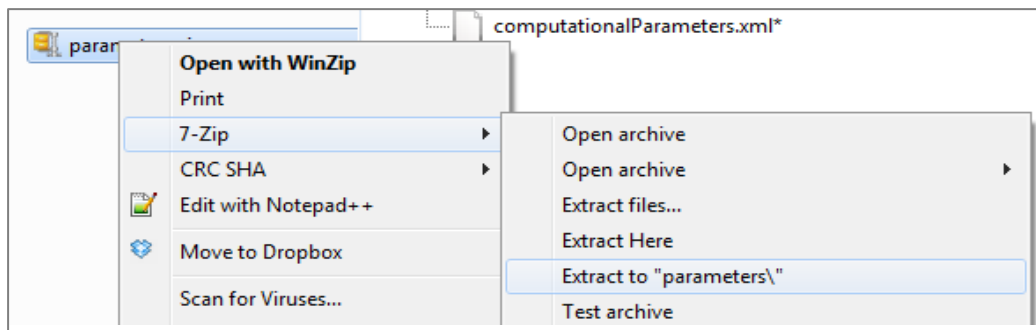


Figure 18

Step 3: When prompted, enter your 7-zip password. (The default password is “newKey”.)

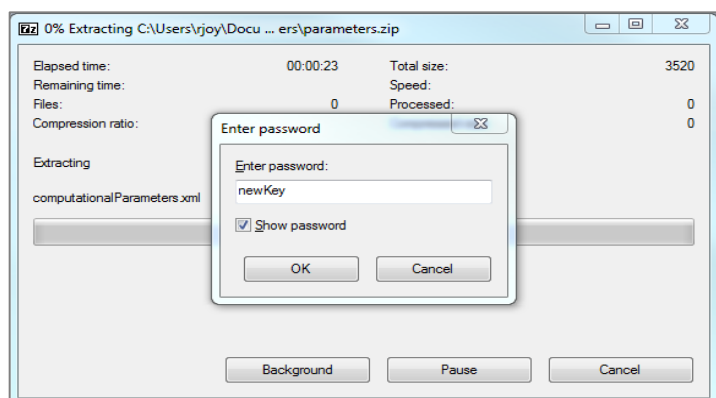


Figure 19

Step 4: A parameters folder is created which contains the files “computationalParameters.xml” and “version.txt”.

7.4 Modifying the Parameters File

The threshold parameters and the computational parameters are stored in the XML-formatted file named “computationalParameters.xml”. You can view the information in Microsoft Internet Explorer or Notepad. If you’d like to edit this file, it is recommended that you download an XML editor (as they help prevent format errors). You should not modify the “version.txt” file. It is also highly recommended that you not modify any of the factory-configured computational values.

7.5 Uploading the Computational Parameters

Step 1: To begin, you must have the files “computationalParameters.xml” and “version.txt” in a folder named “parameters”. The file name must consist of all lowercase letters.

Step 2: Archive and encrypt the parameters folder using 7-zip. Right click on the folder, select 7-zip, and add to archive. (If the 7-zip option is not available, you may open the 7-zip utility from the Start Menu.)

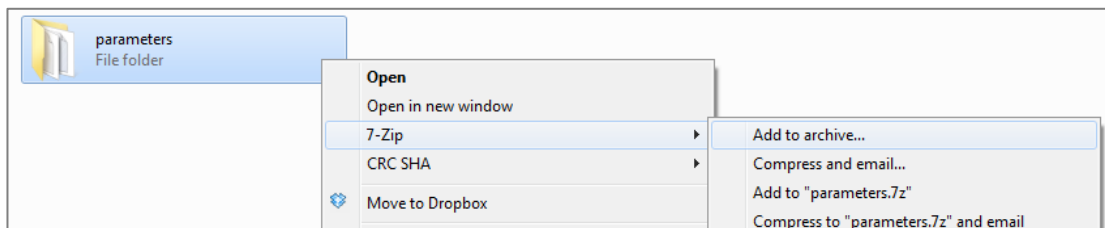


Figure 20

Step 3: Enter the encryption key (default is “newKey”), the AES-256 Encryption method, and the zip archive format as shown in Figure 22. Press OK and the parameters.zip file will be created and ready for upload.

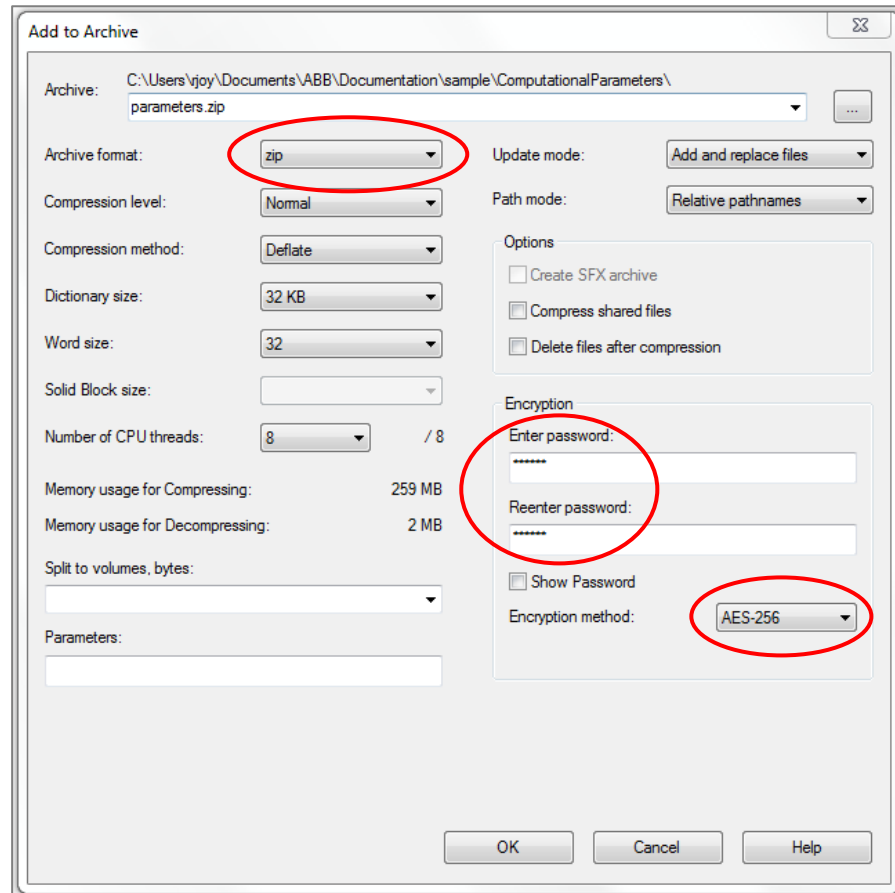
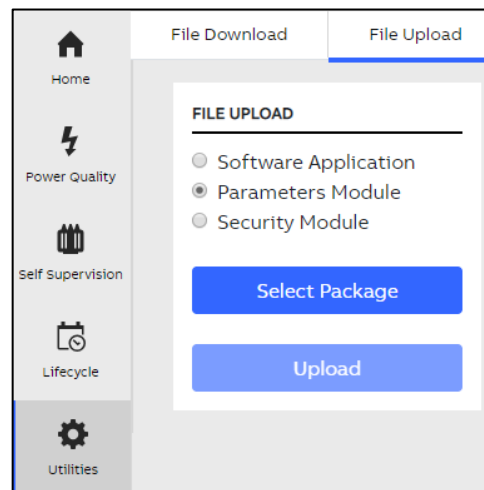


Figure 22

Step 4: Navigate to the File Upload tab on the Utilities View. Activate the Parameters Module selection, then click on the Select Package button to navigate to the file selection prompt. Select the parameters.zip file then Click on the Upload button.



Step 6: The TXpert module automatically resets after the update. You will have to reestablish Wi-Fi or Ethernet communication.

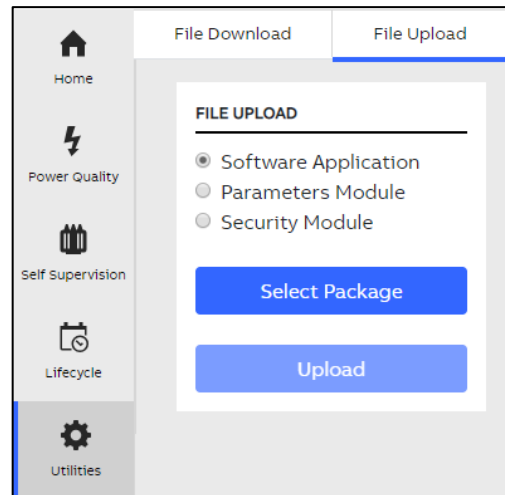
You may confirm the status and time of the update in the Events View. Note: detailed logs are stored in the “update_info” table in the TXpert database.

8 Application Update

In certain circumstances, ABB may recommend that you update the application software running on the TXpert module.

Step 1: To begin, you must have the ABB-provided file named “application.zip”.

Step 2: Navigate to the File Upload tab on the Utilities View. Activate the Software Application selection, then click on the Select Package button to navigate to the file selection prompt. Select the application.zip file then Click on the Upload button.



Step 4: The TXpert module automatically restarts after the update. You will have to reestablish Wi-Fi and Ethernet communication.

You may confirm the status and time of the update in the Events View. Note: detailed logs are stored in the “update_info” table in the TXpert database.

9 Security Credentials Update

The TXpert module has several layers of security. A Security update can be used to update the listed security credentials.

Credential	Description	Default
Wi-Fi password	Wi-Fi password	password
Security certificates with pass phrase	Security certificates with pass phrase	pass
Database encryption key	Key used to encrypt and decrypt uploaded packages. 300 character max.	Newkey
Database deletion pass phrase	Password required for database deletion	password

Table 12

To perform a security update, you must update a 7-zip archived file named *security.zip*. This archive must contain the following files.

File Name	Description
Hostapd_new.conf	Wi-Fi configuration file for the system
encryptiondbkey.txt	File containing the database encryption key
server.crt	Server security certificate
server.key	Server security key
passphrase.txt	Passphrase for server security key
ca.crt	Certificate authority security certificate
deletedbkey.txt	Password for deleting the database.
version.txt	Version of update

Table 13

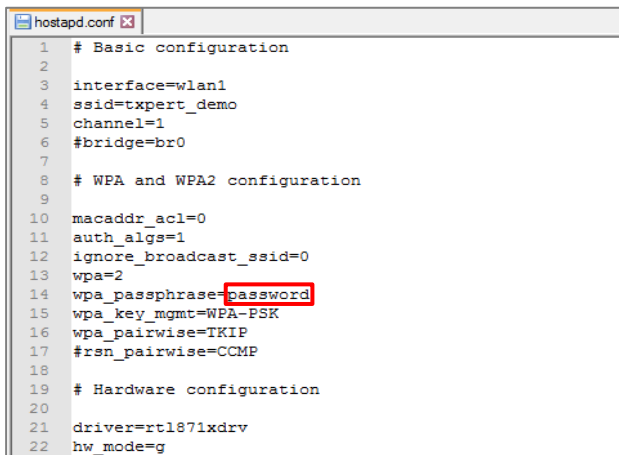
9.1 Modifying and Updating the Credentials File

Step 1: Before modifying the existing “security.zip” file, make a backup of the file so you can have a copy of the default credentials.

Step 2: Right-click on the “security.zip” file and extract using 7-zip. (If the 7-zip option is not available, you may open the 7-zip utility from the Start Menu.) Extract to the “security\” folder. When prompted, enter your 7-zip password. (The default password is “newKey”.) Note: the folder name should be all lowercase characters.

Step 3: Change the Wi-Fi Password (optional)

In the security folder, edit the file “hostapd_new.conf” changing the text in the highlighted area.



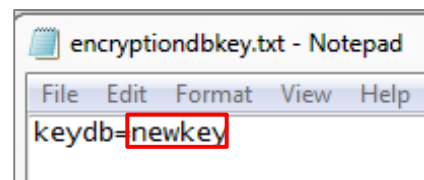
```

1 # Basic configuration
2
3 interface=wlan1
4 ssid=txpert_demo
5 channel=1
6 #bridge=br0
7
8 # WPA and WPA2 configuration
9
10 macaddr_acl=0
11 auth_algs=1
12 ignore_broadcast_ssid=0
13 wpa=2
14 wpa_passphrase=password
15 wpa_key_mgmt=WPA-PSK
16 wpa_pairwise=TKIP
17 #rsn_pairwise=CCMP
18
19 # Hardware configuration
20
21 driver=rtl871xdrv
22 hw_mode=g
  
```

Figure 23

Step 4: Change database encryption key (optional)

Edit the “encryptiondbkey.txt” file changing the text in the highlighted area.



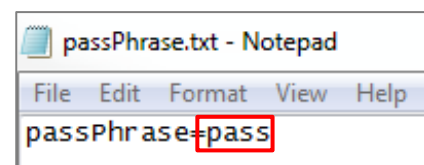
```

keydb=newkey
  
```

Figure 24

Step 5: Change the passphrase for the server security key (optional)

Edit the “passPhrase.txt” file changing the text in the highlighted area.



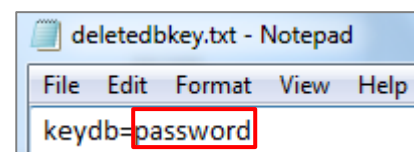
```

passPhrase=pass
  
```

Figure 25

Step 6: Change the database deletion key (optional)

Edit the “deletedbkey.txt” file changing the text in the highlighted area.



```

keydb=password
  
```

Figure 26

Step 7: Change the server security certificate and key (optional)

To change the server security certificate, replace the “server.crt” file in the security folder. To change the server security key, replace the “server.key” file in the security folder.

Step 8: Change the Version

Edit the “version.txt” file changing the text in the highlighted area.

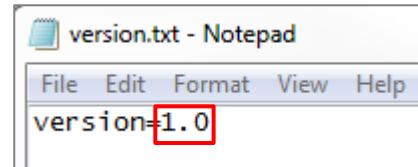
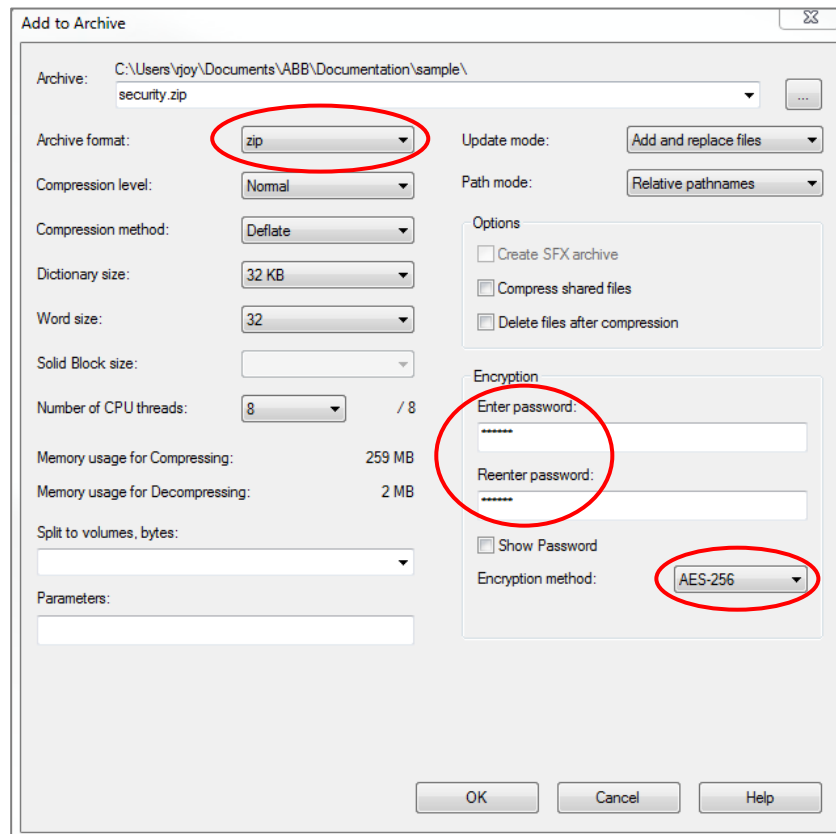
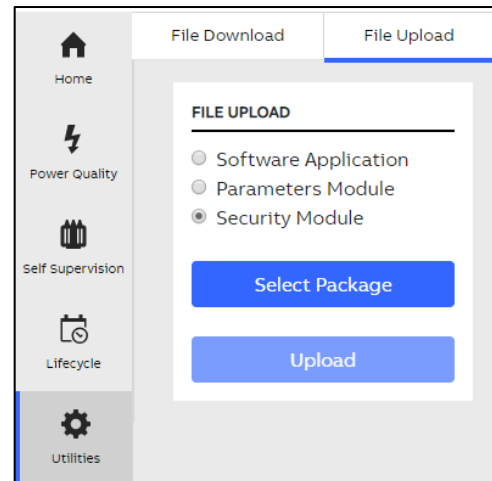


Figure 27

Step 9: Archive and encrypt the security folder using 7-zip. Right click on the folder, select 7-zip, and add to archive. (If the 7-zip option is not available, you may open the 7-zip utility from the Start Menu.)**Step 10:** Enter the **existing** encryption key (default is “newKey”), the AES-256 Encryption method, and the zip archive format as shown in Figure 22. Press OK and the security.zip file will be created and ready for upload.

Step 11: Navigate to the File Upload tab on the Utilities View. Activate the Security Module selection, then click on the Select Package button to navigate to the file selection prompt. Select the security.zip file then Click on the Upload button..



Step 13: The TXpert module automatically restarts after the update. You will have to reestablish Wi-Fi and Ethernet communication.

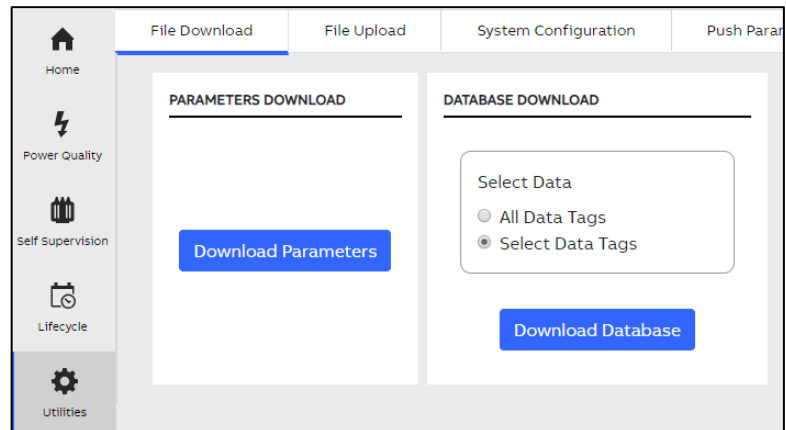
You may confirm the status and time of the update in the Events View. Note: detailed logs are stored in the "update_info" table in the TXpert database.

10 Database Operations

10.1 Viewing the Database

Note: While it is possible to download the entire database, the database file may be large and the download can be a lengthy process. It is recommended that you narrow your selection by date or data set.

Step 1: Navigate to the File Download tab on the Utilities View. Activate the Select Data Tags selection.



Step 2: Select the date range and database fields you want to include in the download by using the arrow keys to transfer parameters between the Tag Manifest list and the Retrieval List. Select Accept button to close the form.

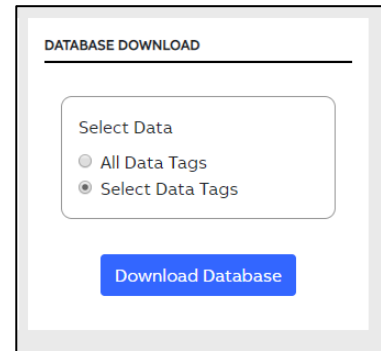
DATA TAG SELECTION

Start Date End Date

Tag Manifest		Retrieval List
HV Coil 3 Consumed Life (Years)		HV Coil 1 Consumed Life (Years)
Hottest Spot Location		HV Coil 2 Consumed Life (Years)
LV Coil 1 Consumed Life (Years)		
LV Coil 1 Temperature (C)		
LV Coil 2 Consumed Life (Years)		
LV Coil 2 Temperature (C)		
LV Coil 3 Consumed Life (Years)		
LV Coil 3 Temperature (C)		

[Close](#)

Step 3: Select the Download Database button. The file named “database.zip” will begin downloading to your laptop/tablet.



Step 2: In the download folder, right click on the database.zip download and extract using 7-zip. (If the 7-zip option is not available, you may open the 7-zip utility from the Start Menu.)

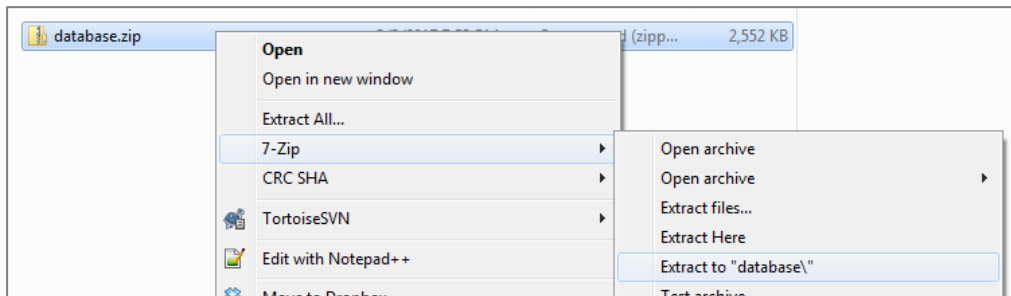


Figure 29

Step 3: When prompted, enter your 7-zip password. (The default password is “newKey”.)

The database folder containing “xpert.db” is created.

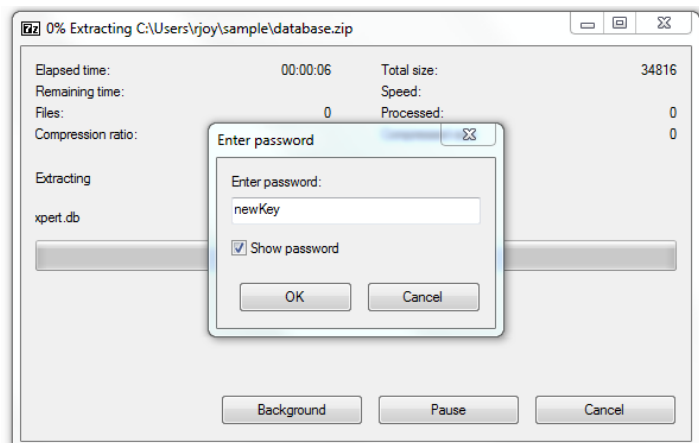


Figure 31

Step 4: The following instruction assume that you are using DB Browser for SQLite as your database viewer. Open the database file “xpert.db”. When prompted enter the database encryption key (default is *newkey*).

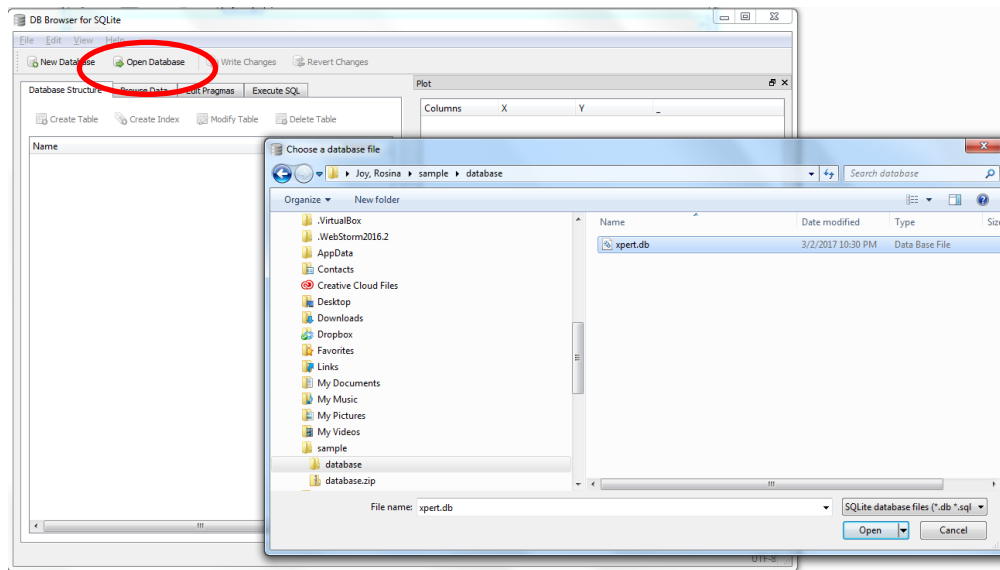


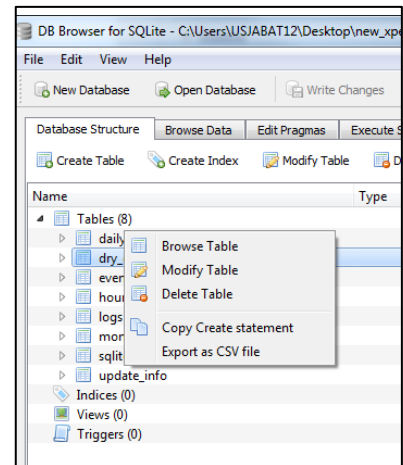
Figure 32

Step 5: Click on the Browse Data tab and select the “dry_data” table to view the accumulated data.

The image shows the DB Browser for SQLite application window with the 'Browse Data' tab selected. The 'dry_data' table is selected in the table list. The table data is displayed in a grid view. The 'dry_data' table has 15 rows of data. The columns are: Poll ID, Poll Number, Poll Time, Ambient Temperature (C), LV Coil 1 Temperature (C), LV Coil 2 Temperature (C), and LV Coil 3 Temperature (C). The data is as follows:

Poll ID	Poll Number	Poll Time	Ambient Temperature (C)	LV Coil 1 Temperature (C)	LV Coil 2 Temperature (C)	LV Coil 3 Temperature (C)
1	1	2019-01-08 1...	23.094	850.0	850.0	850.0
2	2	2019-01-08 1...	23.094	850.0	850.0	850.0
3	3	2019-01-08 1...	23.125	850.0	850.0	850.0
4	4	2019-01-08 1...	23.141	850.0	850.0	850.0
5	5	2019-01-08 1...	23.141	850.0	850.0	850.0
6	6	2019-01-08 1...	23.172	850.0	850.0	850.0
7	7	2019-01-08 1...	23.172	850.0	850.0	850.0
8	8	2019-01-08 1...	23.188	850.0	850.0	850.0
9	9	2019-01-08 1...	23.219	850.0	850.0	850.0
10	10	2019-01-08 1...	23.219	850.0	850.0	850.0
11	11	2019-01-08 1...	23.234	850.0	850.0	850.0
12	12	2019-01-08 1...	23.25	850.0	850.0	850.0
13	13	2019-01-08 1...	23.234	850.0	850.0	850.0
14	14	2019-01-08 1...	23.25	850.0	850.0	850.0
15	15	2019-01-08 1...	23.25	850.0	850.0	850.0

Step 6: To export the data to an MS Excel compatible format (Comma Separated Value (CSV)), right-click on the “dry_data” table in the database structure and select “Export as CSV file” from the popup menu.



Step 7: Similar to Steps 5 and 6, other tables such as Events information and Update_Info may be viewed and exported.

11 Push Communication

You may configure the TXpert as a MQTT client that publishes messages containing recorded data using a JavaScript Object Notation (JSON) syntax. There is a separate application, the ABB TXpert Push Communication Client, which acts as both a broker and a subscriber client.

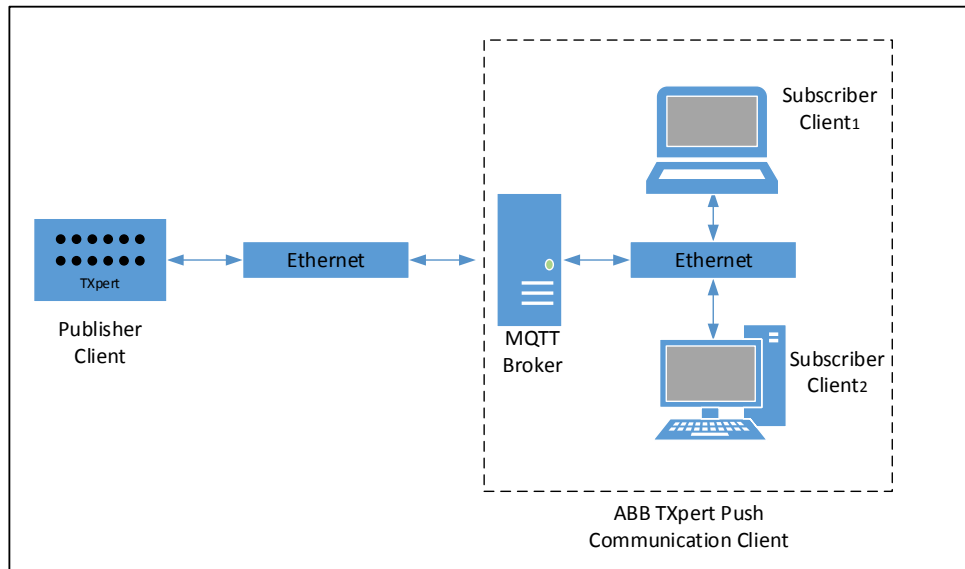


Figure 33

11.1 TXpert Push Communications Configuration

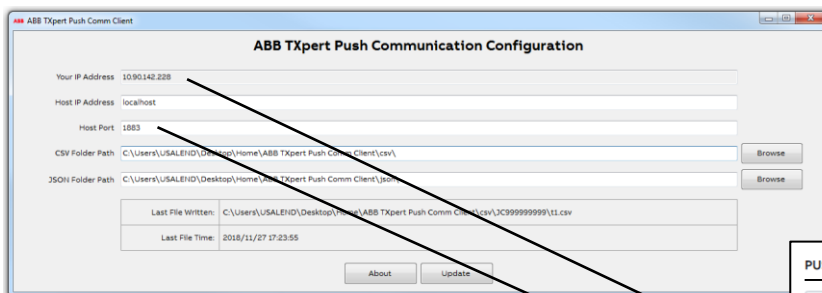
The TXpert must be configured to “push” data to the Client Application. This is done by accessing the Push Parameters Configuration form from the Utilities view on the TXpert WebUI. The Push Parameters view manages

- the configuration of the MQTT (Message Queuing Telemetry Transport) protocol that is used to communicate with ABB’s Push Communication Client via the Ethernet port, and
- the content and periodicity of the MQTT messages.

The screenshot shows a web interface with three main sections:

- PUSH PARAMETERS CONFIGURATION:** Contains input fields for 'TXpert Name' (TX0123456), 'Client ID / Hostname' (10.90.144.21), and 'Client Port' (1883). An 'Update Configuration' button is below.
- EVENTS:** A toggle switch for 'Events' is currently turned 'On'.
- PUSH PARAMETERS STATUS:** Three status indicators with orange warning triangles: 'Configuration Not Configured', 'Status Not Sending', and 'Events Not Sending'.
- MESSAGE CONFIGURATION:** Includes a 'Message Name' dropdown menu, a 'Message Frequency (in Seconds)' input field, and two lists of tags: 'Available Tags' (Ambient Temperature (C), Calculated Hottest-Spot Temperature (C), Energized Time (Years), Fan Circuit 1 current (A), Fan Circuit 2 current (A)) and 'Selected Tags'. Navigation arrows (>>, >, <, <<) are between the lists. 'Save Message' and 'Delete Message' buttons are at the bottom.

11.1.1 Configuring MQTT Push Communication



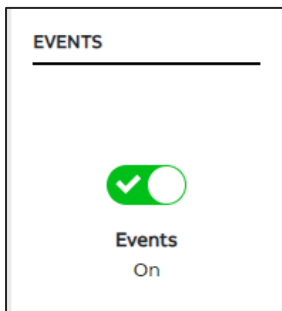
This inset shows a close-up of the 'PUSH PARAMETERS CONFIGURATION' section from the main interface, highlighting the 'TXpert Name', 'Client ID / Hostname', and 'Client Port' fields, along with the 'Update Configuration' button.

1. Enter the name of the device. The default value is the nameplate serial number of the TXpert transformer.
2. Enter the client IP address or hostname for the MQTT broker.
3. Enter the port number for the MQTT broker. The default port for MQTT is 1883. (It may be changed for more advanced configurations.)
4. Click the Update Configuration button.

The Push Parameters status box displays real-time status information. The configuration status will change to configured.

This inset shows a close-up of the 'PUSH PARAMETERS STATUS' section, which now displays three status indicators with orange warning triangles: 'Configuration Not Configured', 'Status Not Sending', and 'Events Not Sending'.

11.1.2 Pushing Event Updates



Changes to the Event status can be pushed to the client. Click on the Events selection to enable or disable the transmission. The Events icon in the status box will indicate sending.

11.1.3 Creating and Modifying Pushed Messages

Figure 34

Step 1: Enter or select the name of the message in the Message Name field (the Message Name is also the name of the stored data files created by the client application).

 A screenshot of a "MESSAGE CONFIGURATION" dialog box. At the top, there are two input fields: "Message Name" with a dropdown menu showing "Select..." and "Message Frequency (In Seconds)" with an empty text box. Below these is a list of tags on the left, including "Ambient Temperature", "Voltage", "Calculated Hottest", "Current", "Energized Time (Years)", "Fan Circuit 1 current (A)", and "Fan Circuit 2 current (A)". A dropdown menu is open over the "Current" tag, showing "GPS" as the selected option. To the right of the tag list are four blue buttons: ">>", ">", "<", and "<<". On the far right is a "Selected Tags" area, which is currently empty.

Step 2: Enter the desired frequency of the message (in seconds) in the Message Frequency field.

Step 3: Select the tags you want to include in the message by using the arrow keys to transfer parameters between the Available list and the Selected List.

MESSAGE CONFIGURATION

Message Name: Voltage

Message Frequency (in Seconds): 7

Available Tags		Selected Tags
Ambient Temperature (C)	>>	P1-G LV RMS U (V)
Calculated Hottest-Spot Temperature (C)	>	P2-G LV RMS U (V)
Energized Time (Years)	<	P3-G LV RMS U (V)
Fan Circuit 1 current (A)	<<	
Fan Circuit 2 current (A)		

Figure 35

Step 4: Click the Send Message button to begin pushing the new (or modified) message. If you are using the ABB TXpert Push Communications Client software, this will cause recording to begin into the new data file.

Step 5: Monitor the status box to verify that the Sending status icon shows success.

Figure 36

11.1.3.1 Parameter Descriptions for MQTT message NEED UPDATED LIST

Parameter	Definition	Unit

Table 14

11.1.3.2 JSON syntax for published messages

The TXpert uses a JSON syntax for the published messages.

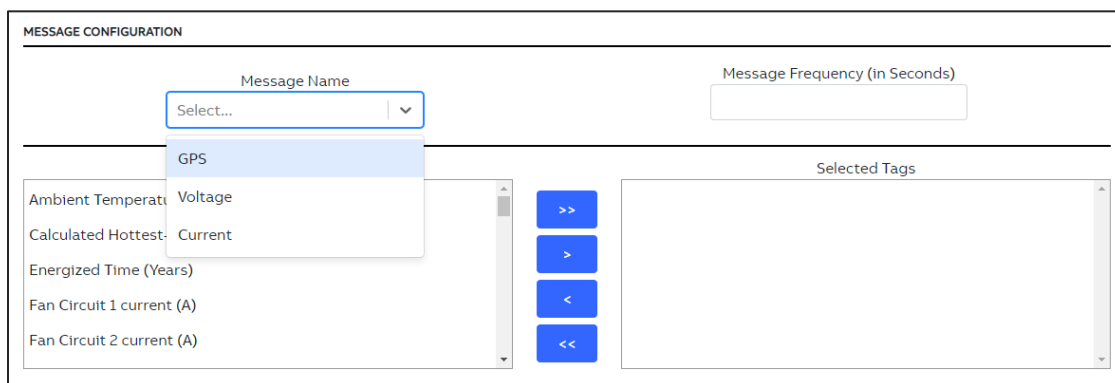
	Value	Meaning
TagDataType	0	Undefined
	1	String
	2	Double
	3	UINT32
	4	Boolean
TagType	0	Data
	1	Calc

	2	Parm
	3	Event
	4	Trends
Alarm State	0	Low_Low
	1	Low
	2	In_Range
	3	High
	4	High-High
	5	Fault

For example, the following message contains data for the “gps_latitude”, ‘gps_longitude’, and ‘gps_time’ parameters.

```
[{"alarmState":2,"dataType":3,"name":"gps_latitude","tagType":0,"value":"NOFIX"},{"name":"gps_longitude","tagType":0,"value":"NOFIX"},{"name":"gps_time","tagType":0,"value":0}]
```

11.1.4 Stopping a Pushed Message



1. To delete a message, select a name from the Message Name dropdown menu.
2. Click the Delete Message button. Note: the data file on the subscriber client does not get deleted.

11.2 Push Communication Client Software

The ABB TXpert Push Communication Client is a Windows-based software tool that allow you to store parameters and events output from TXpert on a personal computer. The software uses the secure MQTT protocol to communicate with the TXpert and stores the data in both Comma Separated Value (CSV) and JavaScript Object Notation (JSON) formats.

The ABB TXpert Push Communication Client begins recording TXpert data the moment it is launched and correctly configured. The system will keep recording data until the application is closed by the user.

Figure 37

You should use a laptop or tablet with these minimum specifications:

Operating System: Windows 7 or greater (64-bit)

Memory (Ram): 4Gb or higher

Networking: Ethernet (connected to same network as the TXpert)

11.2.1 Installing the Client Application

Step 1: Navigate to the ABB TXpert Push Comm Client Installer executable (.exe) file and run to begin the software installation program).

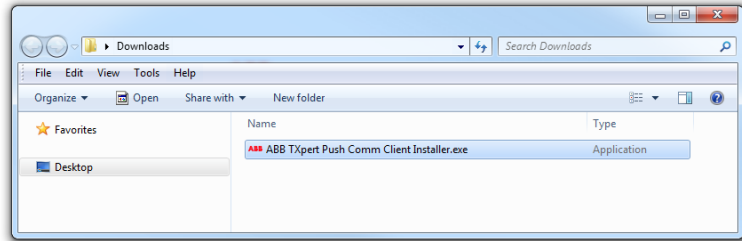


Figure 38

Step 2: When prompted, agree to the License Agreement by clicking “I Agree”.

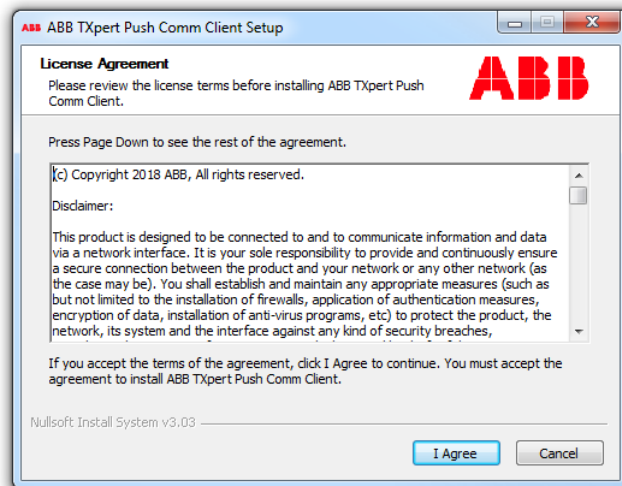


Figure 39

Step 3: Select the installation directory. This directory will also be the default file save location for the CSV and JSON files. Click “Next”.

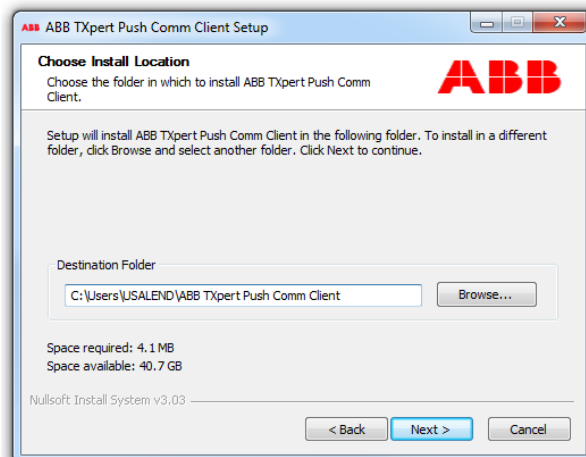


Figure 40

Step 4: Select your installation options, then click “Install”.

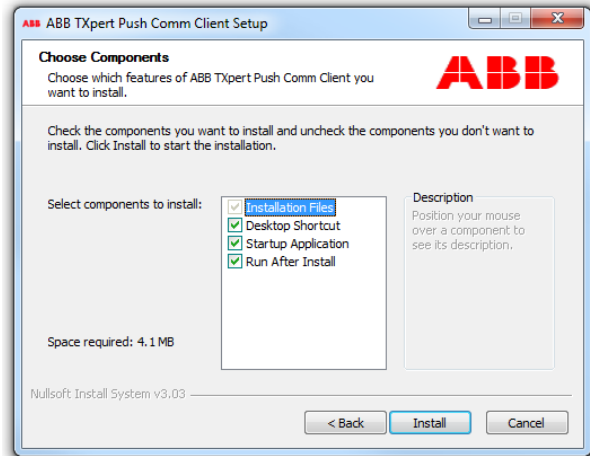


Figure 41

Step 5: When the installation is complete click “Close”.

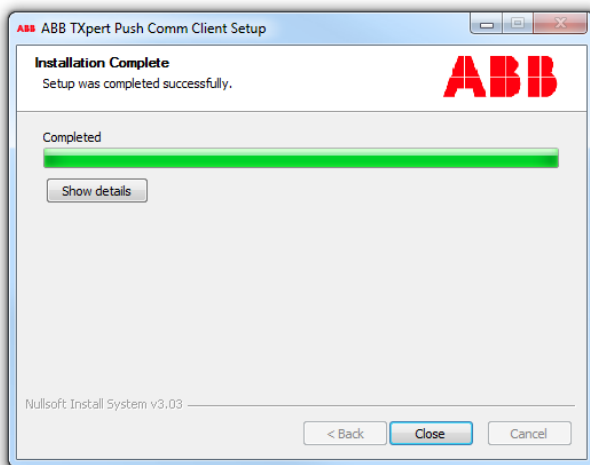


Figure 42

11.2.2 Manually Launching the Client Application

To launch the software manually, double click on **one** of the following:

- the **ABB TXpert Push Comm Client** shortcut on the Desktop.
- the **ABB-TXpert-Push-Comm-Client.exe** in your installation directory.

11.2.3 Using the Software

After the software is launched, the ABB TXpert Push Communication Client appears as an icon in the system tray

Right click on the ABB TXpert Push Comm Client icon to open a dialog showing options.

- The **Configure** option opens the **Configuration Page**.
- The **Exit** option closes the ABB TXpert Push Comm Client application.

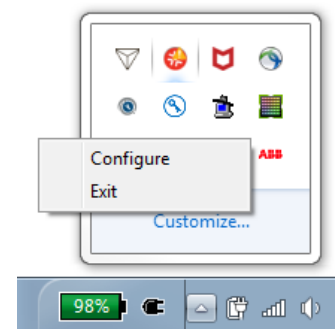


Figure 43

11.2.3.1 Client Application Configuration Page

Figure 44

Field Name	Description
Your IP Address	The IP address of your computer. (Display only)
Host IP Address	Enter the Host IP address of the MQTT broker. The default value is localhost . If you would like to connect to the MQTT broker on another computer or server, enter the IP address of that machine.
Host Port	Enter the Host Port of the MQTT broker. The default value is 1883 .
CSV Folder Path	The folder where the CSV files are saved. The default is the TXpert Device Name.
JSON Folder Path	The folder where the JSON files are saved. The default is the TXpert Device Name.
Last File Written	Displays the location and name of the last updated CSV data file.
Last File Time	Displays the time the last file was written.
Update	After you have entered the configuration values, select Update to save the values. (Close the window without updating to cancel.)
About	Launches a pop-up that shows the licensing information.

Table 15

11.3 CSV and JSON Files

The filenames of the CSV and JSON files will directly correspond to the name of the data files defined in the TXpert WebUI.

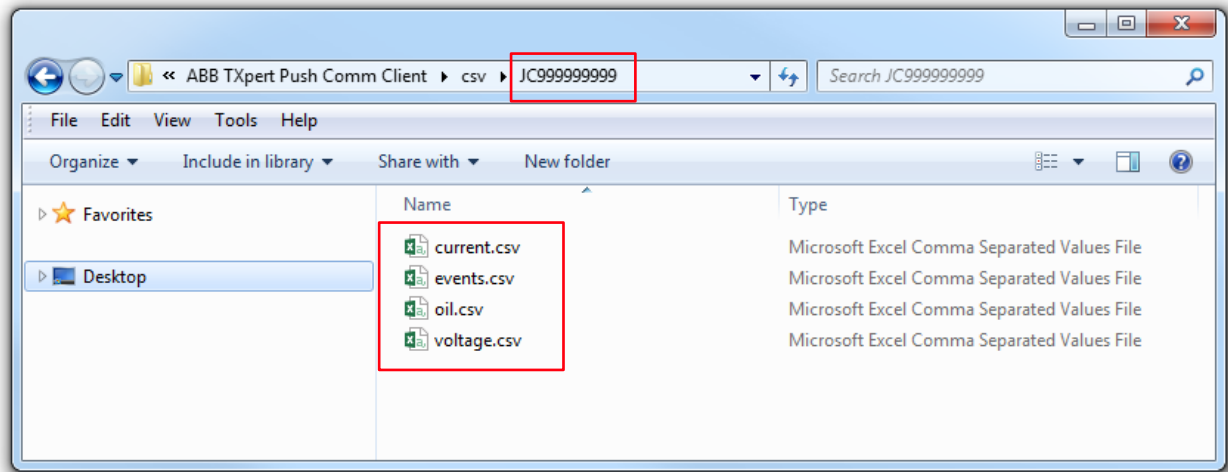


Figure 45

The software will always append new data to existing files. The software will always append with the new data even when the WebUI is restarted, when the client software is restarted, or when the push communication engine on the TXpert is restarted.

11.3.1 Exiting the Software

To exit the software, open the tray icons and right click on the ABB TXpert Push Comm Client icon. Select "Exit". This will stop the background execution.

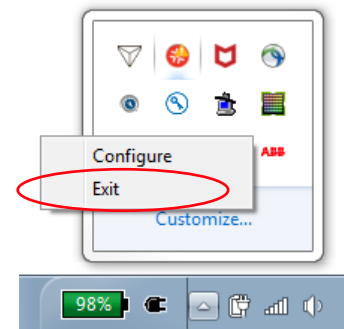




Figure 46

12 Appendix A – Customer Installation



DANGER—SERIOUS DAMAGE TO HEALTH/RISK TO LIFE

Ensure no voltage is present prior to installation. Follow applicable safety standards and regulations.



NOTICE

Take care to avoid twisting the connectors mounted on the Txpert during installation or removal of cables.

12.1 Necessary Equipment and Parts

	Item	Qty	Unit	Equipment
	1	1	ea	Wire/Cable cutters
Alarm / Fan Relay Hook Up	2	1	ea	Wire strippers (20AWG)
	3	as needed	m	Extension wiring for alarm and trip wiring
	4	2	ea	Extension lug for 20AWG Wire
	5	2	ea	Bolt (sized to extension lug)
Fan Hook Up	6	1	ea	Wire strippers (sized for customer power wiring)
	7	8	ea	M4 ring terminal (lug)
	8			
	9			
	10			
	11			

Table 16

12.2 Alarm and Trip Wiring Connection

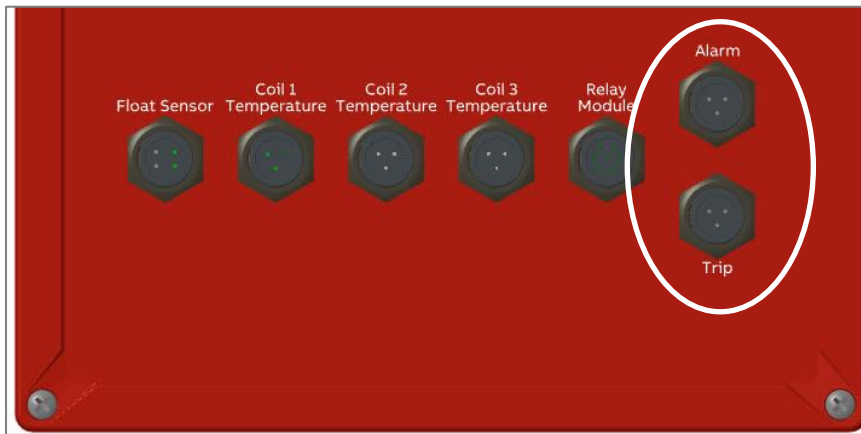


Figure 47

The TXpert Main Module controls the alarm (Hooter) and trip relay of the transformer line protection (on the High Voltage Switch Gear). Connection cables are pre-installed. These connections protect the customer's assets and are critical to hook up during field installation.

It's advised to finalize the installation of these connections to limit damage done to the unit if a high or critical temperature limit is detected. The alarm connection provides an audible or visual alarm when the unit temperature is hitting a high threshold. The trip connection shuts down the power supply to the transformer when the winding temperature has reached a critical limit.

The alarm and trip are black cables and are coiled up and connected near the TXpert Main Module. The alarm wire has a blue cap and the trip wire has a red cap. An extension wire is required to connect to the relays.

Are they connected to the main unit at the factory or is the whole cable bundled?

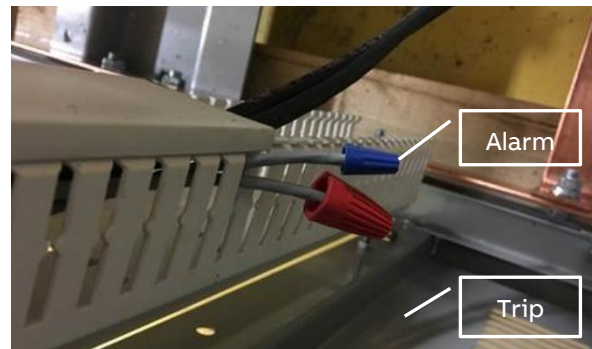


Figure 48

Wire List			
Cable End	Alarm – Trip Relay	Wire Color	Signal
1	Normally Closed	Black	Relay N.C.
2	Common	White	Relay Common
3	Normally Open	Green	Relay N.O.

Installation Steps:

1. Determine the required extension wire length to get from the TXpert Main Module to the relay on the High Voltage Switch Gear.

2. Cut and strip the alarm wire and the extension wire 0.25" inch (6.5mm) then crimp the required lug onto each wire. Bolt the alarm wire lug to the extension lug. Connect the extension wire to the alarm relay of the Transformer line protection.
3. Repeat steps 1 and 2 with the trip wire.

12.3 Communications Pod and Ethernet Connections

The Communications Pod provides Wi-Fi communication to the TXpert system and must be attached in an area that can be safely accessed while the transformer is energized.

Communications Module Kit List			
Item	Qty	Part ID	Part Description
1	1	1LBU100194A0002	Communications Pod
2	1	1LBU100187AXXXX	Communications Pod Cable (6-pin)
3	2	1LBU100230A0001	RFID Card
4	1		Bracket
5			HW?
6			HW?
7	1	1LBU100209AXXXX	Ethernet Cable

Table 17

The Communications Pod is shipped with a bracket, attach the bracket as required by the space. The pod may be attached horizontally or vertically.

Route the cable from the main TXpert module to the Communications Pod and connect. A sample installation is shown below. **Assuming the one end is already connected?**



Figure 50

Figure 49

Ethernet Cabling

The ethernet cable is used to connect to the TXpert User Interface without using WI-FI.

On an enclosed unit, the RJ45 termination end of ethernet cable is in the control or monitor cabinet. A customer-provided Ethernet Cable can be plugged into the female connector and then inserted into a compatible laptop or personal computer or an Ethernet switch or router.

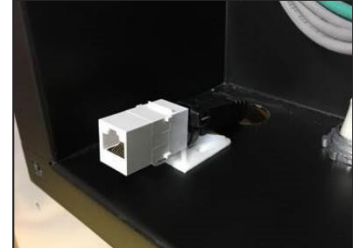


Figure 51

On a unit that is not delivered with an enclosure, the ethernet cable is coiled up at the base of the connections. Note that in this instance the cable termination is a male RJ45 plug. This plug can be inserted directly into a laptop, personal computer, router, or switch.



Figure 52

12.4 Relay Module — Fan Power Wiring

Fans are controlled by the TXpert when temperature over-threshold events are detected.

1. If the power for the fans is provided by the customer, locate the power source.
2. If an outbound power connection is not already existing, crimp a customer-selected lug onto the power connection wire and attach to the auxiliary power source with a flat washer, lock washer, bolt combination.
3. Route to the Relay Module (1LBU100259A0001), cut the wires to length and strip back 0.25" inch (6.5mm) of the insulation. Crimp a M4 lug onto the wire and connect to L1 "In"
4. Repeat by running a separate, parallel line to L2 "In."
5. Complete the same process from the Neutral bushing to the N1 "In" and N2 "In" connections.

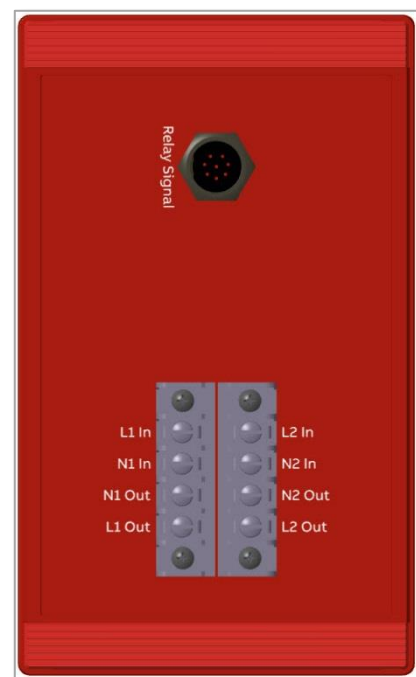


Figure 53

What about connecting the outputs?

What are the plans for setting the fan current? Will the installers be equipped with an external power supply to exercise the fans and grab the reading? Will it occur after energization?

Power Up TXpert without Energization

If the customer purchased an external power supply, the TXpert can be activated prior to the energization of the unit (if desired). Remove the ground cable from the 24DC input and plug the external power supply into the TXpert Main Module, then plug it into an outlet. There will be small "beep" when it is powered on. Wait approximately 60 seconds and then follow the WIFI connection instructions in section xyz. When finished, unplug the external power supply from the outlet first, and then from the TXpert Main Module. Reinstall the ground plug into the 24DC input.

What about installing the stickers?

13 Appendix B – Service Mode

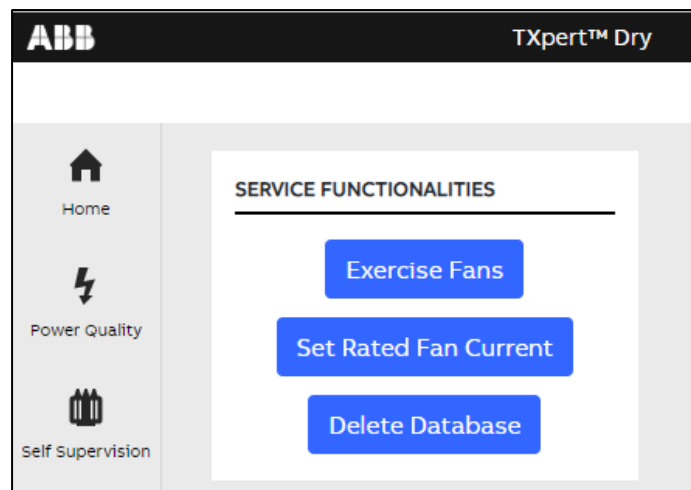


NOTICE

Service mode should only be accessed by qualified service personnel.

13.1 Access

Service mode is accessible via Ethernet by connecting to the WebUI with “/service” appended to the IP address. It is not intended to be used as part of normal operation.



13.2 Functionality

13.2.1 Exercise Fans

Turns both fans on for one minutes.

13.2.2 Set Rated Fan Current

While the fans are on, selecting this button instructs the TXpert to read the baseline current for each fan circuit. This current reading is stored as a system parameter.

Parameter	Description	Units
parmRatedCurrentFanCircuit1	baseline current for circuit 1	Amps
parmRatedCurrentFanCircuit2	baseline current for circuit 2	Amps

13.2.3 Delete Database

1. To initiate the deletion of the database stored on the TXpert, click “Delete Database”.
2. A verification prompt will appear to prevent accidental deletions.
3. If you choose to continue, you will be prompted to enter a password. The default password is “password”.
4. Select “OK” and the database is deleted. The TXpert will automatically restart.
5. After the restart completes, you will be prompted to continue.

The new database will have the same setup as the previous database. The new database will have the password that is in the encryptiondbkey.txt file in the TXpert system. (See Application Update.)



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