HarmonicGuard® Series

Drive-Applied Harmonic Filter

Installation, Operation, and Maintenance Manual

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A	Release	10/16/13
B	Added Fuse Monitor Option	02/03/14
C	Added Heater & Vibration Pad Options	09/10/14
D	Added 600V Option Changed P/N to 28557-1	11/24/14
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O	Updates to PQconnect Parameter tables	01/27/21
P	Updates to Installation Checklist and Over-Temperature Switch, minor updates to PQconnect section	04/06/21
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R	Added EtherNet/IP Information Updated PQConnect Parameter Databases Updated Bluetooth PQvision App	9/15/23
S	Updated PQconnect section and Troubleshoot Tips	01/29/24
T	Updated PQconnect Parameter Tables and added additional Information for new C3 Firmware update. Release of EtherNet/IP Add-On Profile	12/16/24

Performance Guarantee

Select and install the appropriate HarmonicGuard® Passive Harmonic Filter in a variable torque, variable frequency AC drive application, within our published technical specifications and we guarantee that the input current distortion will be less than or equal to 5% THID for standard HarmonicGuard Series filters at full load, and less than 8% at 30% load. If a properly sized and installed filter fails to meet its specified THID level, TCI will provide material for necessary modifications or replacement filter at no charge.

HarmonicGuard filters can also provide similar performance in other drive applications such as constant torque, DC drives and other phase-controlled rectifiers, but actual THID levels can vary by load and/or speed and therefore cannot be guaranteed. Consult factory for assistance when applying HarmonicGuard filters on these types of equipment.

MINIMUM SYSTEM REQUIREMENTS:

The guaranteed performance levels of this filter will be achieved when the following system conditions are met:

Frequency: 50 Hz / 60Hz ± 0.75Hz

System Voltage: Nominal System Voltage (line to line) ±10%

Balanced Line Voltage: Within 0.5%

Background Voltage Distortion: < 0.5% THVD

The input VFD current waveform shall be consistent with that of a VFD with 3% AC line reactance at full load.

NOTE: The presence of background voltage distortion will cause motors & other linear loads to draw harmonic currents.

Additional harmonic currents may flow into the HarmonicGuard filter if there is harmonic voltage distortion already on the system.

If higher levels of harmonic voltage distortion (2%-5%) are present, please use the high background distortion version of the HarmonicGuard filter.

***For PQconnect:** To run PQvision software, minimum system requirements are Windows 7 and 1280x720 resolution.

Table of Contents

1.0 Safety

Safety Instructions Overview

This section provides the safety instructions which must be followed when installing, operating, and servicing the HarmonicGuard Passive filter. If neglected, physical injury or death may follow, or damage may occur to the filter or equipment connected to the HarmonicGuard filter. The material in this chapter must be read and understood before attempting any work on or with the product.

The HarmonicGuard filter is intended to be connected to the input terminals of one or more VFDs. Three-phase power is connected to the input terminals of the HarmonicGuard, and power is supplied to the VFD or VFDs through the filter. The instructions, and particularly the safety instructions for the VFDs, motors, and any other related equipment must be read, understood, and followed when working on any of the equipment.

Warnings and Cautions

This manual provides two types of safety instructions. Warnings are used to call attention to instructions that describe steps that must be taken to avoid conditions that can lead to a serious fault condition, physical injury, or death.

Cautions are used to call attention to instructions that describe steps that must be taken to avoid conditions that can lead to a malfunction and possible equipment damage.

Warnings

Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with warning statements highlighted by the following symbols:

Warning 	Dangerous Voltage Warning: warns of situations where high voltage can cause physical injury and/or damage to equipment. The text next to this symbol describes ways to avoid the danger.
Warning 	General Warning: warns of situations that can cause physical injury and/or damage to equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.
Warning 	Electrostatic Discharge Warning: warning of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

Cautions

Readers are informed of situations that can lead to a malfunction and possible equipment damage with caution statements:

Caution 	General Caution: identifies situations that can lead to a malfunction and possible equipment damage. The text describes ways to avoid the situation.

General Safety Instructions

These safety instructions are intended for all work at the HarmonicGuard. Additional safety instructions are provided at appropriate points in other sections of this manual.

Warning 	Be sure to read, understand, and follow all safety instructions.
Warning 	Only qualified electricians should carry out all electrical installation and maintenance work on the HarmonicGuard filter.
Warning 	All wiring must be in accordance with the National Electrical Code (NEC) and/or any other codes that apply to the installation site.
Warning 	Disconnect all power before working on the equipment. Do not attempt any work on a powered filter.
Warning 	The HarmonicGuard filter, drive, motor, and other connected equipment must be properly grounded.
Warning 	After switching off the power, always allow 5 minutes for the capacitors in the HarmonicGuard filter and in the drive to discharge before working on the HarmonicGuard, the drive, the motor, or the connecting wiring. It is a good idea to check with a voltmeter to make sure that all sources of power have been disconnected and that all capacitors have discharged before beginning work.

2.0 General Information

Thank you for selecting the HarmonicGuard Passive filter. TCI has produced this filter for use in many variable frequency drive (VFD) applications that require input power line harmonic current reduction. This manual describes how to install, operate, and maintain the HarmonicGuard filter. Please contact TCI Technical Support or visit TCI Support for additional information.

Intended Audience

This manual is intended for use by all personnel responsible for the installation, operation, and maintenance of the HarmonicGuard filters. Such personnel are expected to have knowledge of electrical wiring practices, electronic components, and electrical schematic symbols.

HarmonicGuard Family Description

The HarmonicGuard (HG) passive filter offers an array of harmonic mitigation solutions designed for specific applications and industry. The HarmonicGuard Standard solution (HGP), and HarmonicGuard Low Capacitance solution (HGL). Throughout this document, the HarmonicGuard passive filter lineup will be abbreviated as HarmonicGuard.

The HGP Solution is the industry leading solution for harmonic mitigation solution with remote connectivity and intelligent control for nonlinear loads such as VFDs and UPS Systems. Offering 5% Total Current Demand Distortion (iTDD) performance for any load conditions.

The HGL Solution is the industry leading solution for harmonic mitigation solution on generators. Offering 5% Total Current Demand Distortion (iTDD) performance for any load conditions.

Receiving Inspection

The HarmonicGuard filter has been thoroughly inspected and functionally tested at the factory and carefully packaged for shipment. When you receive the unit, you should immediately inspect the shipping container and report any damage to the carrier that delivered the unit. Verify that the part number of the unit you received is the same as the part number listed on your purchase order.

Storage Instructions

If the HarmonicGuard filter is to be stored before use, be sure that it is in a location that conforms to published storage humidity and temperature specifications stated in the Table 1: HarmonicGuard Technical Specifications. Store the unit in its original packaging.

TCI Limited Warranty Policy

TCI, LLC ("TCI") warrants to the original purchaser only that its products will be free from defects in materials and workmanship under normal use and service for a period originating on the date of shipment from TCI and expiring at the end of the period described below:

Product Family	Warranty Period
KLR, KDR	For the life of the drive with which they are installed.
HGA, KMG, MSD, V1K	One (1) year of useful service, not to exceed 18 months from the date of shipment.
PF Guard, HGP, HGL, HSD, HSE, HSL, KRF	Three (3) years from the date of shipment.
KCAP, KTR	Five (5) years from the date of shipment.
All Other Products	One (1) year of useful service, not to exceed 18 months from the date of shipment.

The foregoing limited warranty is TCI's sole warranty with respect to its products and TCI makes no other warranty, representation, or promise as to the quality or performance of TCI's products. THIS EXPRESS LIMITED WARRANTY IS GIVEN IN LIEU OF AND EXCLUDES ANY AND ALL EXPRESS OR IMPLIED WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This warranty shall not apply if the product was:

a) Altered or repaired by anyone other than TCI.
b) Applied or used for situations other than those originally specified; or
c) Subjected to negligence, accident, or damage by circumstances beyond TCI's control, including but not limited to, improper storage, installation, operation, or maintenance.

If, within the warranty period, any product shall be found in TCI's reasonable judgment to be defective, TCI's liability and the Buyer's exclusive remedy under this warranty is expressly limited, at TCI's option, to (i) repair or replacement of that product, or (ii) return of the product and refund of the purchase price. Such remedy shall be Buyer's sole and exclusive remedy. TCI SHALL NOT, IN ANY EVENT, BE LIABLE FOR INCIDENTAL DAMAGES OR FOR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF INCOME, LOSS OF TIME, LOST SALES, INJURY TO PERSONAL PROPERTY, LIABILITY BUYER INCURS WITH RESPECT TO ANY OTHER PERSON, LOSS OF USE OF THE PRODUCT OR FOR ANY OTHER TYPE OR FORM OF CONSEQUENTIAL DAMAGE OR ECONOMIC LOSS.

The foregoing warranties do not cover reimbursement for removal, transportation, reinstallation, or any other expenses that may be incurred in connection with the repair or replacement of the TCI product.

The employees and sales agents of TCI are not authorized to make additional warranties about TCI's products. TCI's employees' and sales agents' oral statements do not constitute warranties; these shall not be relied upon by the Buyer and are not part of any contract for sale. All warranties of TCI are embodied in this writing and no other warranties are given beyond those set forth herein.

TCI will not accept the return of any product without its prior written approval. Please consult TCI Customer Service for instructions on the Return Authorization Procedure.

3.0 Pre-Installation Planning

Verify the Application

Make sure that the HarmonicGuard filter is correct for the application. The voltage rating of the filter must match the input voltage rating of the connected drive. The horsepower and current ratings of the filter must be appropriate for the connected load.

HarmonicGuard Drive-Applied Filter

The HGP and HGL are drive-applied harmonic filters designed and developed by TCI to reduce the harmonic currents drawn from the power source by VFDs with six-pulse diode bridge rectifier. The published filter's voltage, Power (HP or kW) and current ratings apply to matching power (Hp or kW) rated standard VFDs with six-pulse diode bridge rectifiers. The harmonic filter may also be sized to filter other loads such as SCR six-step drives, SCR Direct Current (DC) motor drives, thyristor furnaces, battery chargers, electroplating supplies, or other types of nonlinear loads. In many cases, the filter power rating (HP or kW) will differ from load power rating (HP or kW). Please contact TCI Technical Support for additional information and support on sizing HGP harmonic filters for your non-six-pulse diode front end VFD applications.

The HGP and HGL are passive filters connected in series with the input terminals of a VFD or several VFDs that operate as a group. It is designed to provide a low impedance path for the major harmonic currents demanded by the driver. The filter is a stand-alone device that can be furnished in its own enclosure and mounted adjacent to the drive. It is also available on an open panel for mounting within an enclosure with the drive or other equipment.

The HGP and HGL filters consist minimally of the following features and components:

- A KDR tuned series reactor to prevent system interaction and improve filter performance.
- A tuned filter circuit with:
    - A TCI three-phase tuning reactor specifically designed for the harmonic filter.
    - High-endurance, harmonic-rated capacitors
    - Larger filters may have multiple tuned circuits. Consult fuse tables to determine if the filter in question has "parallel" branches.
    - Bleeder resistors to ensure safe capacitor discharge upon filter shutdown.
    - Cooling fans (on select models) to ensure adequate cooling and safe operating temperatures.
    - Compression terminals for ease and integrity of all power and control wiring
    - Fuses - sized to protect the capacitor wiring.

Nameplate Data

The following information is marked on the nameplate:

- Part number: encoding is explained on the following page.
- FLA: the rated continuous operating motor current (RMS amps)
- System Voltage: the rated three-phase line voltage (RMS volts)
- Hz: the rated frequency
- Phase: 3 – The HGP/HGL filter is designed for use only with three-phase power
- Serial #: Filter serial number for Bluetooth pairing
- Drawing #: outline and mounting dimension drawing number
- Schematic #: schematic diagram drawing number.
- Manufacturing #: for TCI internal use
- Enclosure Type: UL designation or "Open" panel construction

Part Numbering System

Figure 1 below identifies the significance of each character in the HarmonicGuard part number. The example part number, HGP0150AW1C2000 designates an HGP filter that is rated 150 HP, 480 volts, 60 Hz, Type 1 Enclosure, with contactor, PQconnect with EtherNet/IP, no other options. It includes a line reactor, tuning reactor, and capacitors in a UL Type 1 enclosure. It is designed for use with a 150 HP drive.

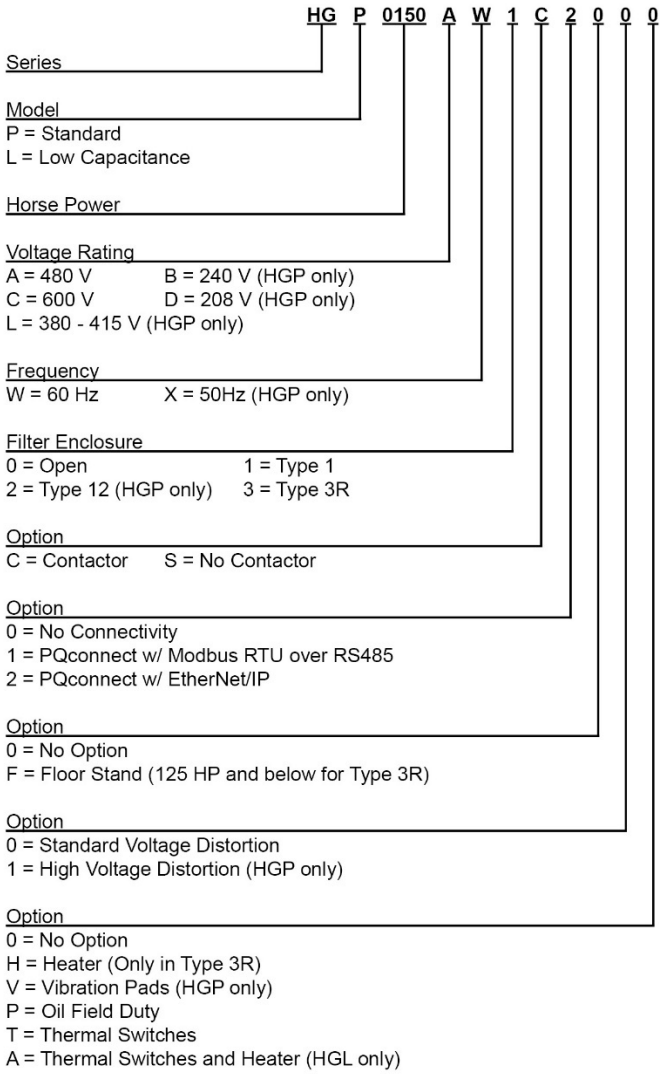


Figure 1: HarmonicGuard Part Number Encoding

HarmonicGuard includes optional thermal switches installed in both the KDR line reactor and KTR tuning reactor monitored by the PQconnect board. Contactor operation is controlled by settings stored in the PQconnect via PQvision. For more information on thermal switches, see section Figure 2: Terminal Block.

Table 1: HarmonicGuard Technical Specifications

Electrical Characteristics	
Voltage / Frequency Ratings	60 Hz, 3 Phase: 480, 600 VACs 60 Hz, 3 Phase: 208, 240 VACs 50 Hz, 3 Phase: 380, 415 VACs
Phase	3Ø
kVAR Ratings	With Contactor as low as 0.0 kVAR/HP Without Contactor 0.15 kVAR/HP (HGL) Without Contactor 0.30 kVAR/HP (HGP)
Load Types	3-phase diode bridge rectifier loads such as PWM AC drives
Input Power Ratings	208, 240 VAC: 5 - 200 HP 380 - 415 VAC: 4 - 1000 kW 480, 600 VAC: 5 - 1250 HP
THID	Less than 5% at full load
TDD	<5% when sized appropriately at input to Load array
SCCR (Short Circuit Current Rating)	100 kA
Immunity from Voltage Distortion	Less than 5% THID at full load with THVD as high as 5%*
Efficiency	Greater than 99%
Overload Capability	200% of current rating for up to 3 minutes/hour
Communication Options	Modbus RTU over RS485 EtherNet/IP
Environmental Conditions	
Operating Temperature	Open: -40°C (-40°F) - 50°C (122°F), Enclosed: -40°C (-40°F) - 40°C (104°F)
Storage Temperature	-40°C (-40°F) - 60°C (140°F)
Elevation	Up to 2,000 m without derating. Consult factory for higher elevations.
Humidity	95% non-condensing
Protection Category	Open Chassis, UL Type 1, UL Type 3R, and UL Type 12 enclosure
Cooling Method	Natural or Forced Air Convection
Agency Approvals	
c UL us LISTED FC RoHS	

*When configured for High Voltage Background Distortion.

HarmonicGuard Filter Overview

The HarmonicGuard® Passive Filter provides a low impedance path for the major harmonic currents demanded by Variable Frequency Drives (VFDs). This greatly reduces the number of harmonic currents flowing through the electrical power distribution system, bringing those harmonic currents in line with the IEEE-519 standard for harmonic distortion mandated by an increasing number of utilities.

The HarmonicGuard Filter includes branch fuses on the harmonic trap circuit capacitors. These fuses are included in the design to prevent damage to the capacitors in the event of excessive harmonic trap current if the filter is misapplied.

HarmonicGuard Options

Contactor Option (C)

This option includes a contactor, control power transformer and connection terminals in the filter circuit which allows the VFD user to control the insertion of this circuit with a relay contact in the VFD. It is recommended that the VFD contact be programmed to open the contactor below 33% motor power. For variable torque (fan) loads this will be approximately below 70% speed, so at-speed contact may be used. This reduces the possibility of leading power factor interacting with other devices on the power system. Contactor logic should also maintain the contactor closed in cases where the VFD is bypassed, and the filter is not bypassed. However, TCI recommends the filter to be bypassed when the VFD is bypassed, to avoid low motor or VFD bypass voltage during startup.

No Contactor Option (S)

This option includes high quality harmonic-grade capacitors and line reactors. This filter will meet most application requirements found today. This cost-effective product is available as an open panel version, in a UL Type 1 or UL Type 12 enclosure, or in an UL Type 3R enclosure. The open panel is perfect for inclusion in an MCC section or easy installation into industry standard enclosures. The UL Type 1 enclosed units maintain the same vertical profile as the open panel design. This design is perfect for applications where floor space is at a premium. The UL Type 3R enclosure protects the filter from harsh conditions.

PQConnect w/ Modbus RTU Option (1)

This option includes a PQConnect board with Modbus RTU capability, control power transformer and connection terminals in the filter circuit which allows the user to control the insertion of this circuit with a relay contact in the VFD or PQVision Software. For an intelligent passive harmonic that autonomously controls its tuning circuit contactor based on your input system to ensure worry free operation. Allowing multiply forms of data capture to your SCADA system or directly to your PLC. Field upgraded to EtherNet/IP option not available.

PQConnect w/ Modbus RTU & EtherNet/IP Option (2)

This option includes a PQConnect board with Modbus RTU and EtherNet/IP capability, control power transformer and connection terminals in the filter circuit which allows the user to control the insertion of this circuit with a relay contact in the VFD or PQVision Software. For an intelligent passive harmonic that autonomously controls its tuning circuit contactor based on your input system to ensure worry free operation, perfect for generator-based systems. The PQConnect with Modbus RTU operation provides monitoring and status data to your SCADA system. EtherNet/IP Protocol Conformance refer to EtherNet/IP section.

Floor Stand Option (F)

The Floor Stand Option is intended for use in applications which require the HG enclosure to be elevated from the floor. The Floor Stand option consists of 12” steel feet available for Type 3R enclosures 150 HP and below only.

Typical Voltage Distortion Option (0)

The Typical Voltage Distortion Option, intended for applications with levels of background voltage distortion less than 2%, is a configuration that enables the HG filter to achieve lower levels of current harmonic distortion in applications with low background voltage distortion.
This performance option is available in all the package options.

High Voltage Distortion Option (1)

The High Voltage Distortion Option, intended for applications with levels of background voltage distortion of 2% or higher, is a configuration that enables the HG filter to achieve lower levels of current harmonic distortion in applications with high background voltage distortion.
This performance option is available in all the package options.

Heater Option (H)

The Heater Option is intended for use in applications which require the environmental protection of a NEMA 3R enclosure. The heater is mounted to the interior of the enclosure and protects sensitive electronic equipment from the harmful effects of corrosion and condensation.
The Heater option is available for all 3R enclosures. When using a Type 12 or Type 3R Enclosure and in a high humidity environment, set thermostat to 37°C (100°F) or max temperature below 37°C (100°F).

Vibration Pad Option (V)

The Vibration Pad Option is intended for use in applications which require environmental noise protection. The resilient mounting material is placed between the reactor and the interior of the enclosure and dampens noise produced by the reactor.
The Vibration Pad option is available for all enclosure types.

Oilfield Duty Option (P)

The Oilfield Duty Option features components designed specifically for oil and gas field applications to handle the additional electrical stress. Designed for cyclical loads these units will be available in Type 3R enclosures and will be for use with HP ranges from 40 to 200.

Over-temperature/Thermal Switch (T)

This option includes an over-temperature switch installed on both the Line Reactor and the Tuning Reactor. On each reactor, over-temperature switches are wired to a terminal block separate from the power terminals. The over-temperature switch opens if unpredicted heating occurs. An interlocking circuit should be used with the over-temperature switch to turn off the VFD to prevent filter damage in the event of filter overheating. The over-temperature switch contact is rated 6 amps at 120 VAC. The over-temperature switches are normally closed, open on temperature rise and typically have the following trip points:

- On a Class R 220°C insulation reactor, the switch opens on rise above 200°C
- On a Class H 180°C insulation reactor, the switch opens on rise above 160°C

Wire the over-temperature switches according to the reactor schematic using T1 and T2 locations on the over-temperature switch terminal block.

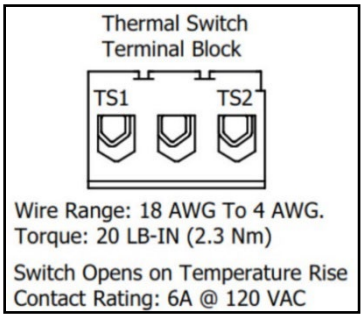


Figure 2: Terminal Block

If this option is ordered with the PQconnect, the Thermal switch feedback will be wired to the PQconnect board, and the PQconnect will indicate whether there is an over-temperature problem. The PQconnect fault relay (J10 header) can be used to be alerted when there is an Over-temp issue as an additional measure. For further detail please refer to the pin out references in section PCB Connections.

4.0 Installation Guidelines

Installation Checklist

- The following are the key points to be followed for a successful installation. These points are explained in detail in the following sections of this manual.
- Make sure that the installation location will not be exposed to corrosive or combustible airborne contaminants.
- Select a mounting area that will allow adequate cooling air and maintenance access.
- Make sure that all wiring conforms to the requirements of the National Electrical Code (NEC) and/or other applicable electrical codes.
- Connect the harmonic filter equipment-grounding lug to the system ground of the premises wiring system.
- Use a properly sized grounding conductor.
- Connect three-phase power to the input terminals of the harmonic filter, L1, L2 & L3.
- Connect the output power terminals of the HG, T1, T2 & T3, to the input power terminals of the VFD.

Select a Suitable Location

Environment

Locating the harmonic filter in a suitable environment will help ensure proper performance and a normal operating life. Refer to the environmental specifications listed above and/or noted on the drawings furnished with the unit.

Warning 	Unless specifically labeled as approved for such use, this equipment is not suitable for use in an explosive atmosphere or in a "Hazardous (Classified) Location" as defined in article 500 of the National Electrical Code (NEC).

The unit must be installed in an area where it will not be exposed to:

- Rain or dripping liquids (unless filter is in a Type 3R enclosure)
- Corrosive liquids or gasses
- Explosive or combustible gases or dust
- Excessive airborne dirt and dust
- Excessive vibration

Working Space

Provide enough access and working space around the unit to permit ready and safe installation, operation, and maintenance. Make sure that the installation conforms to all working space and clearance requirements of the National Electrical Code (NEC) and/or any other applicable codes. Provide enough unobstructed space to allow cooling air to flow through the unit. Keep the widest or deepest portion of the unit enclosure having ventilation openings a minimum of six inches from adjacent walls or other equipment. The unit enclosure sides that do not have ventilation openings should be kept a minimum of three inches from adjacent walls or other equipment.

Mounting

The harmonic filter must be mounted vertically on a smooth, solid surface, free from heat, dampness, and condensation.

If you are mounting an open panel unit in your own enclosure, you must provide an enclosure that is adequately sized and ventilated sufficiently to prevent overheating. The rating and dimension tables for open panel units list the watts of heat loss dissipated by the harmonic filter. The maximum temperature of the air around the harmonic filter's capacitors, line reactor, and tuning reactor should not exceed 50°C (122°F).

Wiring

When selecting a mounting location for the harmonic filter, plan for the routing of the power wiring. Route the conduit and wiring from the power source to the filter and then to the VFD. The harmonic filter is provided with internal fuses.

Cable Entry Locations

The enclosed harmonic filters are not provided with enclosure wiring knockouts. A location can be selected at the time of installation. Typical or recommended cable entry locations are shown on the drawings which can be found on the TCI website.

HarmonicGuard HGP Solution: https://www.transcoil.com/ratings_table/hgp-ratings-table/

HarmonicGuard HGL Solution: https://www.transcoil.com/ratings_table/hgl-ratings-table/

Field Wiring Connection Terminals

Compression type terminals (Lug Options) are provided for all field wiring connections. The wire size capacity ranges and tightening torque for all field wiring connections are listed in Table 2-Table 4.

Grounding

The HarmonicGuard filter panel equipment-grounding lug must be connected to the ground of the wiring system. The equipment-grounding connection must conform to the requirements of the National Electrical Code (NEC) and/or any other codes that apply to the installation site. The ground connection must be made using a wire conductor. Metallic conduit is not a suitable grounding conductor. The integrity of all ground connections should be periodically checked.

Caution 	Use copper wire that is appropriate for the voltage and current rating of the equipment. The wire selection must conform to the requirements of the National Electrical Code (NEC) and/or other applicable electrical codes. For units rated less than 100 amps, use wire with an insulation temperature rating of 60°C or higher. For units rated 100 amps or more, use wire with an insulation temperature rating of 75°C or higher.

Connect the three-phase power of the appropriate voltage and current capacity to the circuit protective device to the filter's input power terminals.

Note: In large HP filters, the input and output power conductors are connected directly to the input and output terminals on the line reactor.

Connect the output terminals of the filter to the input power terminals of the VFD.

Filter's Schematic

Inspect the installation to make sure that all equipment has been completely and correctly installed in accordance with the Installation Guidelines section of this manual.

- Check to see that the cooling fan(s) are operating in units so equipped.
- Check to make sure power connections are torqued to recommended torque value.

Since all HG products are passive filters, it is always operating whenever the drive is operating.

The Schematic shown below is an illustration of typical HG filter wiring.

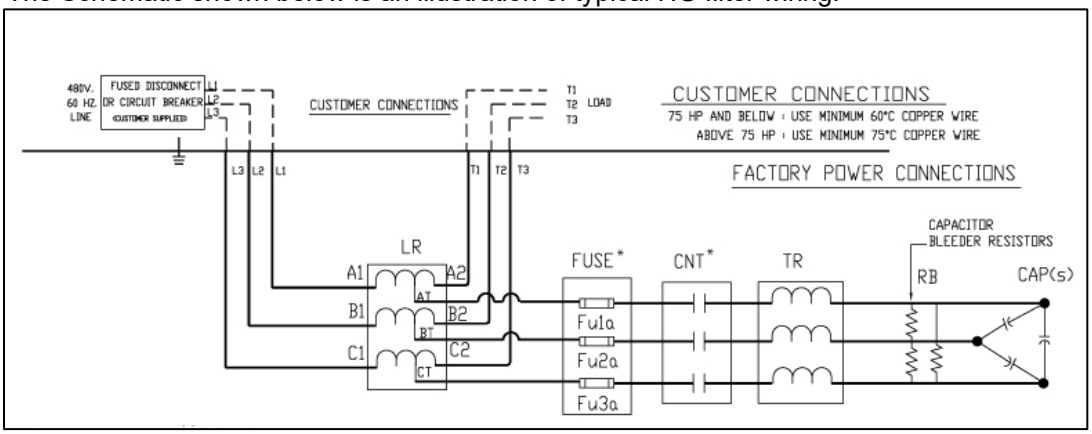


Figure 3: Typical HarmonicGuard (HG) Filter Wiring for up to 480 V/800 HP

Always refer to the drawings and other information shipped with your unit. Consult applicable wiring codes, UL, and NEC, for current limiting and disconnect requirements.

Warning	Exercise caution when connecting the filter to the VFD. Internal filter components may carry dangerous voltage which can cause death or serious injury upon contact. Remove all power to the HarmonicGuard filter in compliance to standardized 26 CFR 1920.147 lockout/tagout policies.

Torque Values

Table 2: HarmonicGuard (HG) 480V Terminal Wire Size Capacity Range and Tightening Torque (CU)

	Line/Load Connections		Ground Connection	
HP Rating	**Wire Range**	**Torque Lbs-in (N-m)**	**Wire Range**	**Torque Lbs-in (N-m)**
3	18 AWG to 4 AWG	20 lbs-in (2.26 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
5	18 AWG to 4 AWG	20 lbs-in (2.26 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
8	18 AWG to 4 AWG	20 lbs-in (2.26 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
10	18 AWG to 4 AWG	20 lbs-in (2.26 N-m)	2 AWG to One 1/0 AWG	50 lbs-in (5.6 N-m)
15	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
20	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
25	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
30	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
40	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
50	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	2 AWG to One 1/0 AWG	50 lbs-in (5.6 N-m)
60	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
75	3 AWG to One 2/0 AWG	50 lbs-in (5.6 N-m)	3 AWG to One 2/0 AWG	50 lbs-in (5.6 N-m)
100	3 AWG to One 2/0 AWG	50 lbs-in (5.6 N-m)	3 AWG to One 2/0 AWG	50 lbs-in (5.6 N-m)
125	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)
150	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)
200	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
250	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
300	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
350	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
400	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
450	Two 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)	Two 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)
500	Two 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)	Two 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)
600	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)
700	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)
800	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)
900	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)
1000	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)
1250	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)

Table 3: HarmonicGuard (HG) 600V Terminal Wire Size Capacity Range and Tightening Torque (CU)

	Line/Load Connections		Ground Connection	
HP Rating	**Wire Range**	**Torque Lbs-in (N-m)**	**Wire Range**	**Torque Lbs-in (N-m)**
3	18 AWG to 4 AWG	20 lbs-in (2.26 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
5	18 AWG to 4 AWG	20 lbs-in (2.26 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
8	18 AWG to 4 AWG	20 lbs-in (2.26 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
10	18 AWG to 4 AWG	20 lbs-in (2.26 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
15	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
20	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
25	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
30	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
40	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
50	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
100	3 AWG to One 2/0 AWG	50 lbs-in (5.6 N-m)	3 AWG to One 2/0 AWG	50 lbs-in (5.6 N-m)
125	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)
150	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)
200	One 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)	One 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)
250	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
300	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
350	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
400	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
450	Two 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)	Two 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)
500	Two 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)	Two 600kcmil to 4 AWG	500 lbs-in (56.5 N-m)
600	Three 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Three 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)
700	Three 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Three 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)
800	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)
900	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)
1000	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)	Four 600kcmil to 2 AWG	550 lbs-in (62.14 N-m)

Table 4: HarmonicGuard (HG) 208V – 240V Terminal Wire Size Capacity Range and Tightening Torque (CU)

		Line/Load Connections		Ground Connection	
HP Rating	**Voltage Rating**	**Wire Range**	**Torque Lbs-in (N-m)**	**Wire Range**	**Torque Lbs-in (N-m)**
3	208 V	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
5		14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
8		14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
10		14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
15		14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
20		6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
25		6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
30		One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)
40		Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
50		Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
60		Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
75		Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
100		Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
150		Three 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Three 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)
200		Three 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Three 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)
8	240 V	14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	14 AWG to One 10 AWG	35 lbs-in (4.0 N-m)
10		14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	One 8 AWG	40 lbs-in (4.5 N-m)
15		14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
20		14 AWG to 6 AWG	30 lbs-in (3.39 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
25		6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)	6 AWG to One 4 AWG	45 lbs-in (5.1 N-m)
30		3 AWG to One 2/0 AWG	50 lbs-in (5.6 N-m)	3 AWG to One 2/0 AWG	50 lbs-in (5.6 N-m)
40		One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)
50		One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)	One 250kcmil to 2 AWG	375 lbs-in (42.4 N-m)
60		Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
75		Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
100		Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)	Two 350kcmil to 2 AWG	375 lbs-in (42.4 N-m)
150					
200					

SCCR Fusing Requirements

See the tables below for specific HarmonicGuard Solution for line fusing requirements that must be supplied to comply with the 100kA SCCR.

Table 5: HGP Customer Installed Line Fuse Requirements to comply with the 100kA SCCR

Voltage	HP/kW Rating	Customer Installed Line Fuse Requirements to Comply with the 100 kA SCCR
600	≤ 40	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
600	> 40	No requirement for SCCR
480	≤40	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
480	> 40	No requirement for SCCR
440	≤30	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
440	> 30	No requirement for SCCR
415	≤30	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
415	> 30	No requirement for SCCR
240	≤ 10	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
240	> 10	No requirement for SCCR
208	≤ 10	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
208	> 10	No requirement for SCCR

Table 6: HGL Customer Installed Line Fuse Requirements to comply with the 100kA SCCR

Voltage	HP/kW Rating	Customer Installed Line Fuse Requirements to Comply with the 100 kA SCCR
600	≤ 40	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
600	> 40	No requirement for SCCR
480	≤ 30	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
480	> 30	No requirement for SCCR

Provisional Fuse Tables

The fuse tables provided below show the fuse ratings of the included branch circuit fuse internal to the HarmonicGuard Filter unit as a fuse replacement reference.

The fuse tables also show a typical line fuse or circuit breaker current rating for overcurrent protection, given the unit's nameplate power rating, if necessary, based on the installation. The line current fuses listed below are typical values given the unit power rating, not required values. Line fusing ratings are determined by the installer, based on input conductor sizing and protection required for downstream equipment. Any drawings or documentation included with the unit literature kit take precedence over the fuse tables below.

Note that to achieve a 100kA SCCR, the customer provided line fuse must be installed as per the requirements provided and sized following NEC (National Electrical Code) guidelines for the source conductors selected by the installer. The branch fuses are required to be installed at the shown ratings.

HGP Fuse Tables

Table 7: Fuse Table for HGP 480 Volt, 60Hz Models

HGP Rating (HP)	Branch Circuit Fuse Current Rating (Included Internal to HGP Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
3	20	30
5	20	30
7.5	20	30
10	20	30
15	20	30
20	20	60
25	20	60
30	20	60
40	30	60
50	30	80
60	50	90
75	50	125
100	60	150
125	80	200
150	100	225
200	125	300
250	150	350
300	175	450
350	200	500
400	225	600
450	250	600
500	300	800
600	350	800
700	400	1000
800	500	1100
900	250/250 (Parallel Branches)	1200
1000	300/300 (Parallel Branches)	1400
1100	350/350 (Parallel Branches)	1500
1200	350/350 (Parallel Branches)	1600
1250	400/400 (Parallel Branches)	1800

Table 8: Fuse Table for HGP 240 Volt, 60Hz Models

HGP Rating (HP)	Branch Circuit Fuse Current Rating (Included Internal to HGP Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
5	20	30
7.5	20	30
10	20	60
15	30	60
20	50	70
25	50	80
30	60	80
40	80	120
50	100	150
60	125	200
75	150	225
100	175	300
125	200	400
150	225	450
200	250	600

Table 9: Fuse Table for HGP 208 Volt, 60Hz Models

HGP Rating (HP)	Branch Circuit Fuse Current Rating (Included Internal to HGP Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
5	20	30
7.5	20	30
10	30	60
15	50	60
20	50	70
25	60	80
30	80	100
40	125	150
50	125	175
60	150	200
75	175	250
100	225	350
150	350	450
200	500	600

Table 10: Fuse Table for HGP 600 Volt, 60Hz Models

HGP Rating (HP)	Branch Circuit Fuse Current Rating (Included Internal to HGP Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
3		
5	20	30
7.5	20	30
10	20	30
15	20	30
25	20	35
30	20	40
40	20	50
50	30	60
60	30	80
75	40	100
100	45	125
125	60	150
150	70	175
200	80	250
250	100	300
300	125	350
350	150	400
400	175	500
450	175	500
500	200	600
600	300	700
700	300	800
800	300	1000
900	350	1100

Table 11: Fuse Table for HGP 380-415 Volt, 50Hz Models

HGP Rating (kW)	Branch Circuit Fuse Current Rating (Included Internal to HGP Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
2.2	20	20
3	20	20
4	20	20
5.5	20	20
7.5	20	20
9.3	20	25
11	20	30
15	20	40
18.5	30	50
22	30	60
30	30	80
37	40	100
45	40	125
55	60	150
75	75	200
90	100	225
110	125	300
132	125	350
160	150	400
200	200	500
250	250	600
315	300	800
355	350	800
400	400	900
450	450	1000
500	500	1200
560	300/300 (Parallel Branches)	1200
630	300/300 (Parallel Branches)	1400
710	350/350 (Parallel Branches)	1600
800	400/400 (Parallel Branches)	1800
900	450/450 (Parallel Branches)	2000

Caution	This manual provides general information describing your HGP filter. Be sure to carefully review the more specific information that is provided by the drawings shipped with the unit. Information provided by the drawings takes precedence over the information provided in this manual. The ratings, dimensions and weights given in this manual are approximate and should not be used for any purpose requiring exact data. Contact the factory in situations where certified data is required. All data is subject to change without notice.

HGL Fuse Tables

Table 12: Fuse Table for HGL 480 Volt, 60Hz Models

HGL Rating (HP)	Branch Circuit Fuse Current Rating (Included Internal to HGL Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
20	20	60
25	20	60
30	20	60
40	20	60
50	25	80
60	30	90
75	30	125
100	45	150
125	60	200
150	70	225
200	90	300
250	125	350
300	150	450
350	175	500
400	175	600
450	200	600
500	225	750
600	250	800
700	300	1000
800	350	1200
900	400	1300

Table 13: Fuse Table for HGL 600 Volt, 60Hz Models

HGL Rating (HP)	Branch Circuit Fuse Current Rating (Included Internal to HGL Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
20	20	30
25	20	60
30	20	60
40	20	60
50	20	70
60	30	80
75	40	100
100	40	125
125	50	175
150	60	200
200	70	250
250	90	300
300	110	350
350	125	400
400	150	450
450	175	500
500	175	550
600	200	650
700	250	750
800	300	900
900	300	1000

HGP Watt Loss

Table 14: 480 V HGP Watts loss

HP	Open	Type 1	Type 3R
3	110	110	125
5	110	110	125
7.5	140	140	160
10	160	160	175
15	215	215	230
20	260	260	275
25	310	310	325
30	265	265	280
40	460	460	500
50	490	490	525
60	650	650	675
75	800	800	850
100	775	775	800
125	900	900	900
150	1150	1150	1200
200	1425	1500	1500
250	1575	1625	1650
300	1975	2020	2025
350	1800	1875	1875
400	1950	2000	2025
450	2175	2550	2275
500	2500	2875	2575
600	1975	2375	2075
700	2150	2550	2575
800	2200	2600	2600
900	3650	4100	4100
1000	2675	3100	3100
1250	2675	3100	3100

Table 15: 600 V HGP Watts loss

HP	Open	Type 1	Type 3R
15	170	170	185
30	275	275	295
40	450	450	480
50	450	450	500
60	620	620	660
75	775	775	800
100	800	800	850
125	850	850	900
150	1100	1100	1175
200	1350	1400	1400
250	1500	1575	1575
300	1450	1500	1500
350	1825	1900	1900
400	1450	1875	1550
450	1950	2350	2010
500	1800	2200	1875
600	1850	2250	1925
700	2100	2500	2500
800	2400	2800	2800
900	2450	2850	2850
1000	3050	3450	3450

HGL Watt Loss

Table 16: 480 V HGL Watts loss

HP	Open	Type 1	Type 3R
20	234	238	238
25	421	-	-
30	333	338	338
40	447	454	454
50	518	525	525
60	582	290	590
75	576	584	584
100	760	771	771
125	871	884	884
150	1051	1066	1066
200	907	921	921
250	1217	1265	1235
300	1454	1476	1476
350	1411	1432	1432
400	1548	1571	1571
450	-	1869	1869
500	-	2083	2083
600	-	2018	2018
700	-	2258	2258
800	-	2472	2472
900	-	3300	3300

Table 17: 600 V HGL Watts loss

HP	Open	Type 1	Type 3R
30	293	297	297
40	341	346	346
50	511	519	519
60	600	609	609
75	734	745	745
100	736	747	747
125	920	934	934
150	1182	1200	1200
200	976	991	991
250	1306	1325	1325
300	1452	1474	1474
350	1766	1792	1792
400	1566	1589	1589
450	2079	2110	2110
500	2014	2014	2014
600	-	2064	2064
700	-	2376	2376
800	-	2766	2766

5.0 PQconnect Connectivity

HarmonicGuard Filter with PQconnect Overview

The PQconnect is an integrated controls option for TCI's industry leading passive harmonic filter used for filtering the input of variable frequency motor drives (VFDs). In the passive harmonic filter, the PQconnect provides basic tuned circuit contactor control and provides unit status detection, metering, waveforms, and power quality data. The PQconnect data is made available via basic Modbus RTU over RS485 serial connection and an optional EtherNet/IP communication. The PQconnect is UL listed and intended for commercial and industrial applications. By default, the PQconnect is manufactured to close the contactor at 30% load.

***Please verify you have the latest manual version for your PQconnect software by visiting https://transcoil.com/products/hgp-5-passive-harmonic-filter/**

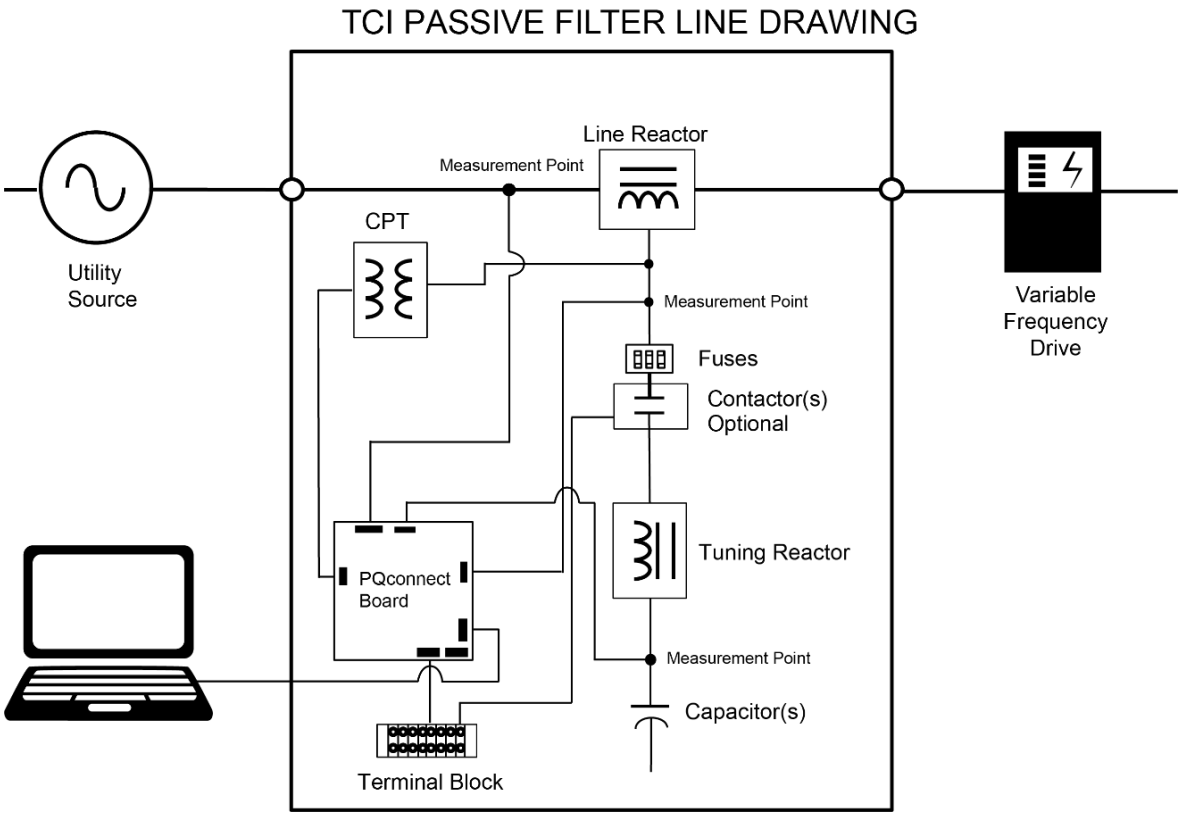


Figure 4: HarmonicGuard Filter with PQconnect Connection Diagram

Communication Options and Connections

PQconnect is an industry-leading monitor and control option for TCI's passive harmonic filter. Currently, three communication methods allow users to access their filters remotely: Modbus RTU, EtherNet/IP, and Bluetooth wireless technology.

Free software applications such as PQvision desktop and mobile app are provided for communication option Modbus RTU and Bluetooth wireless technology for real-time filter line/load voltage, current metering values, visual voltage and current waveforms, and spectrum data.

PCB Connections

Most customer connections to PQconnect will be made on the PCB. Refer to connection diagrams in Figure 5: PQconnect Connections. The details of the power and communications terminals are shown in

Table 18: Power & Communications Terminals. Form C relays are available on the PCB, these connections are shown in Table 19: Form C Relay Contacts.

Two relay outputs are available on the PCB. When drilling holes for wire access please ensure no metal shavings are on the PQconnect board.

The relay contactor control command input connection on J11 of the PCB allows the user to open/close the contactor of the HarmonicGuard Passive filter. The second relay (input connections on J12) is optional and could be used for a second contactor for dual tuned circuit filters or as a secondary status detection.

Filter purchases with EtherNet/IP will include two external connections for customers to connect their ethernet port. Refer to the connection diagrams below.

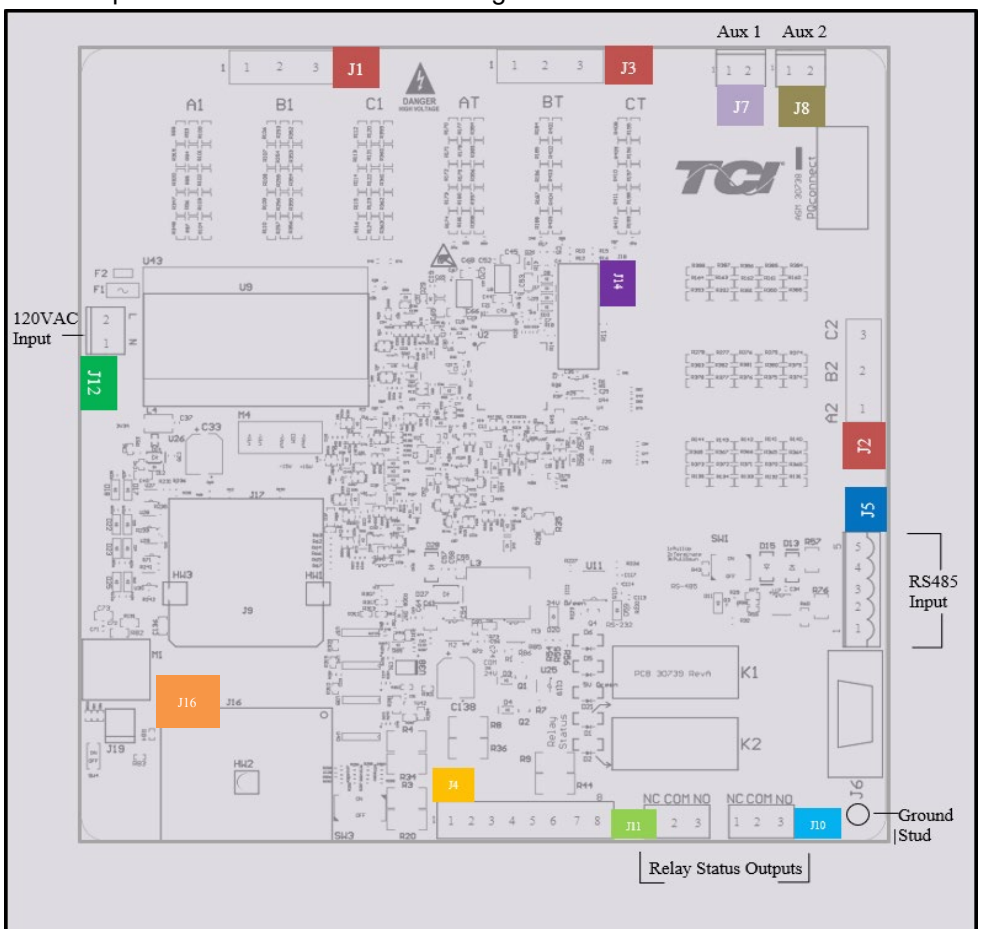


Figure 5: PQconnect Connections

Table 18: Power & Communications Terminals

Terminal	Pin	Description	Label	Rating
J1, J2, J3	1	Phase A	For factory use; Measurement connection points	600 VAC
	2	Phase B		
	3	Phase C		
J4	1,2,3,4	Not Connected		N/A
	5,6,7,8	Current transformer connections	For factory use, only used for filters with dual tuned circuits	N/A
J5	1	Modbus RTU over RS485	Not Connected	N/A
	2		B (non-inverting)	
	3		Ground	
	4		A (inverting)	
	5		Not connected	
J12	1	Input Power from control power transformer	Neutral	120 VAC
	2		Line	
J14	1-14	Micro Programming	For factory use	N/A
J16	1	EtherNet/IP	TD-	N/A
	2		TD-	
	3		RD+	
	6		RD-	
	4,5,7,8		Termination	

Note: *The power terminals on the PQconnect accept 28 to 14 AWG stranded wire, with a tightening torque of 4.4 in-lb. (0.5 Nm).*

Table 19: Form C Relay Contacts

Terminal	Pin	Description	Label	Tightening Torque	Wire Range
J7	1, 2	Multi-functional digital Input 1	Customer contacts	3.5 lb.-in (0.4 Nm)	28-12 AWG
J8	1, 2	Multi-functional digital Input 2	Customer contacts	3.5 lb.-in (0.4 Nm)	28-12 AWG
J11	1	Digital output form C Contact 1	Normally Closed (NC)	4.4 lb.-in (0.5 Nm)	28-14 AWG
	2		Common (COM)		
	3		Normally Open (NO)		
J10	1	Digital output form C Contact 2	Normally Closed (NC)	4.4 lb.-in (0.5 Nm)	28-14 AWG
	2		Common (COM)		
	3		Normally Open (NO)		

Note: *Form-C relay contacts are gold plated with a load rating of 5.0A @ 120VAC*

The filter is set to control the contactor pickup/drop-out at 30% of load current by factory default. This setting can be changed to the tech access page from the settings menu.

Multi-functional digital inputs have the following functions:

- DEFAULT: 0 = Disabled
- 1 = Tuning Reactor Thermal Switch Input
- 2 = Line Reactor Thermal Switch Input
- 3 = Reset Command
- 4 = External Control Input

Digital Output form C Contact

- J11 reserved for contactor control.
- J10 used for status detection.

Wiring and Configuration

The PQconnect implements a Modbus RTU Master/Slave device, which supports two-wire RS-485 signal levels. The PQconnect communication port used for the Modbus RTU interface is connected directly to the PCB. An optional EtherNet/IP communication can be selected for the standard PQconnect board.

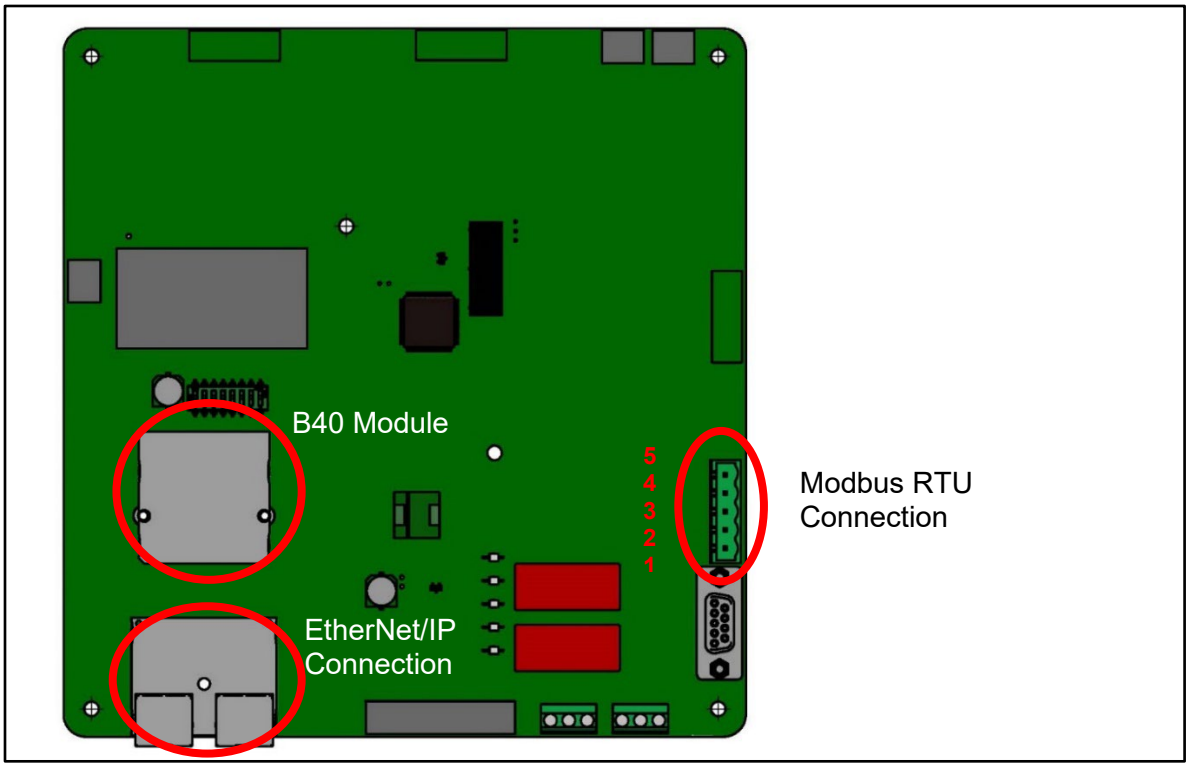


Figure 6: PQconnect Modbus RTU Connection and Optional EtherNet/IP

The hardware pinout header and default protocol settings are shown below for the J5 communication header.

Table 20: Modbus Connector Pin Definitions

J5 Header Pinout	Signal Name	Signal Type
1	No connect	-
2	D+	RS-485 B (non-inverting)
3	GND	RS-485 SC/G
4	D-	RS-485 A (inverting)
5	No connect	-

Table 21: Modbus RTU Protocol Settings

Parameter	Default Value	Units
Baud Rate	115200	Bd
Data Bits	8	Bits
Stop Bits	1	Bits
Parity	Even	-
Slave ID	10	-

The Pin definitions and default protocol settings for the EtherNet/IP interface are shown below which correlates to J16 communication header.

Table 22: EtherNet/IP Connector Pin Definitions for Port 1 & 2

J16 Header Pinout	Signal Name	Signal Type
1	Port 1	N/A
2	Port 2	N/A

Table 23: EtherNet/IP Protocol Settings

Setting	Default Value
IP Address	192.168.1.35
Gateway	0.0.0.0
Subnet	255.255.255.0
DHCP	Disabled

The default Modbus settings can be modified via the PQconnect system menu. A Tech level access password is required to change these parameters. Ensure the board communicates to the desktop app and then First go to **Menu -> Settings -> Modbus -> Change to desired Modbus parameters -> Apply ->Menu -> Save Settings.** Finally, go to Menu -> Reset PQconnect, this will reboot the PQconnect with the desired Modbus parameters.

Note: if the contactor state is closed it will open when clicking the reset command.

The network interface on the PQconnect allows the user to control the contactor and show internal status data of the HGP filter. The PQconnect PC application (PQvision) accesses a ModbusRTU master device for the network interface (see the PQvision application display connections).

Table 24: Configuration Switches

SW1	Configure Modbus Connection on J5 Header	1 – Enable 560Ω bias resistor on D-.
		2 – Enable 120Ω termination resistor.
		3 - Enable 560Ω pull-up on D+.
J20	Remove jumper to use default Modbus settings on next reboot.	

The input and output registers from the HarmonicGuard Passive filter are mapped to the Modbus Analog Output Holding Registers starting at address 40000. All input and output registers are two bytes in size and formatted as 16-bit signed integers.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014).*

Modbus RTU

The PQconnect Modbus RTU network communication interface transmits and receives command and status data from the PQconnect Modbus master over an RS-485 serial link. Modbus RTU is a simple serial communications protocol originally developed by Modicon for use with Programmable Logic Controllers (PLCs) in control of industrial devices. Modbus RTU is commonly supported by most PLCs and is an open, royalty-free communications standard. The PQConnect board can be connected to PQvision desktop application for real-time monitoring for any HarmonicGuard Filter.

PQvision PC application Screen Elements

This section focuses on the operation of the PQvision application. The PC application contains several screens that allow the user to monitor the status of the HarmonicGuard Passive filter. Additionally, the PQvision application can be used for contactor control and basic setup of the HarmonicGuard Passive filter. Enter password **08252014** to enable tech access.

Please ensure the latest version of PQvision is downloaded to your PC by accessing the software at https://transcoil.com/products/hgp-5-passive-harmonic-filter/pqvision-software/

To run the PQvision software, an RS485 to USB converter will need to be connected to terminal J5 on the PQconnect PCB with pin orientation as described in Table 20: Modbus Connector Pin Definitions the USB connector will need to run to a laptop or PC.

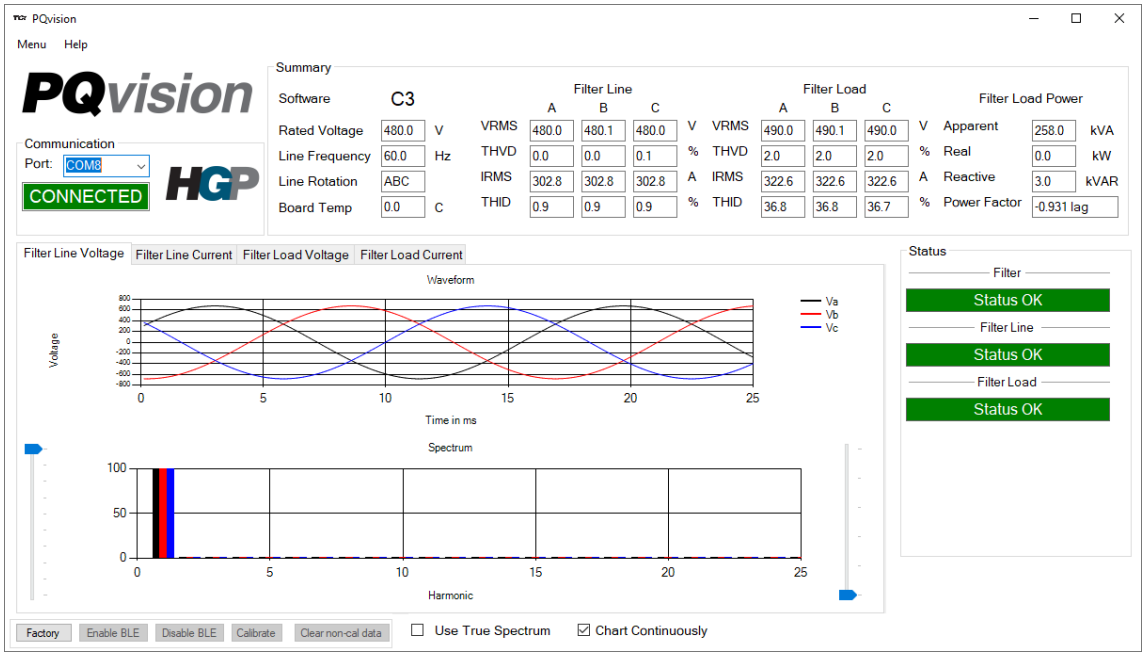


Figure 7: PQvision Desktop Application

Table 25: PQvision PC Navigation

Options	Description
Toolbar	Communication Status and Communication Port To determine the COM port, go to Device Manager Ports (COM & LPT) and finding "USB Serial Port." ***Note:*** *If Modbus settings differ from the default values shown in Table 20: Modbus Connector Pin Definitions, then cycle power of the HarmonicGuard Passive filter.*
	DSP Rev: Latest software revision will be displayed.
	Filter Serial Number – Displays below the Communication status.
	Menu: Save settings, about screen, software update, tech access Settings – Modbus, contactor control, kVAR settings, alert management view Figure 8-Figure 10
	Help – Direct links to the TCI Home page and tech support contact information.
Summary Data	(THVD) Displays the Total Harmonic Distortion of the utility Line/Load voltage as a percentage.
	(THID) Displays the Total Harmonic Distortion of the utility Line/Load current as a percentage.
	Displays three-phase real power (P) of the filter output in kW*
	Displays three-phase reactive power (Q) of the filter output in kVAR*
	Displays three-phase apparent power (S) of the filter output in kVA*
	Displays filters output power factor. 1.00 indicates unity power factor. A negative power factor indicates lagging power factor.
	Displays the current utility line frequency in Hz.
	Displays the supply voltage into the HarmonicGuard Passive filter.
	Displays the filters input/output phase current in Amps RMS
	Displays Line rotation.
	Displays board temperature.
Waveforms	The PQconnect PC application supports capture and display of real time system voltage and current data. Three phase waveform data can be viewed for Filter Line/Load Voltage, and Filter Line/Load Current. Phase A – Black Phase B – Red Phase C – Blue
	Harmonic Spectrum (Left toggle to zoom in on the spectrum and right to increase the spectrum to the 50th harmonic) the value of the fundamental is 100.
Status Detections	Status alerts for the input, output and of the filter will display according to severity of the alerts. Hovering over status alert will give a brief description of what the problem may be.

*Line/Load power values are calculated using fundamental values.

PQconnect Reset command: If changing the Modbus settings, the user will be required to reset the PCB after saving settings. This can be easily done through the menu by clicking menu and Reset PQconnect. The reset command will only work if the PCB is communicating with the desktop application or Modbus network. Note: resetting the board will open the contactor if contactor state is closed.

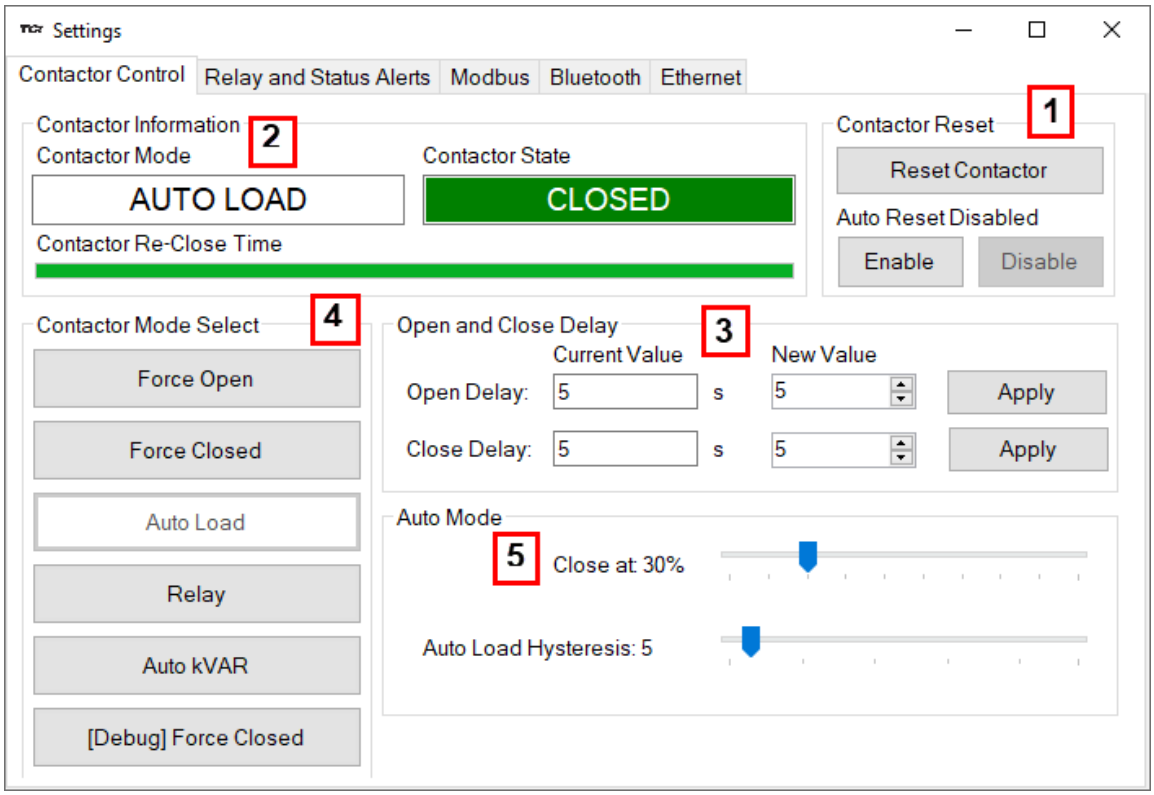


Figure 8: Contactor Control Settings Menu

Table 26: Contactor Control Settings Menu

Designators	Name	Description
1	**Contactor Reset**	Allows the user to reset the state of the contactor. By default, the contactor is set to Auto reset the contactor
2	**Contactor information**	Explains the contactor control mode and state.
3	**Open and Close Delay**	Contactor delays in seconds. After selecting desired new value apply and save settings.
4	**Contactor Mode Select**	**Force Open** will leave the contactor in an open state. **Force Closed** will leave the contactor in a closed state. **Auto Load** will close the contactor based on the load percentage selected. **Relay** will open/close the contactor depending on relay input configuration. By default, these are disabled. **Auto kVAR**: Based on the size of the filter the user can adjust their target kVAR settings to open/close the contactor. Note: Negative setpoint is a lagging target, positive setpoint is a leading target. **[Debug] Force Close** will keep the contactor closed for 15 minutes regardless of any Alerts that occur. This is used for debugging purposes for technicians. **When changing the contactor control state, save settings to make the change final. Saving settings will open the contactor.**
5	**Auto Mode**	Auto Mode allows the user to adjust the conditions how the contactor closes.

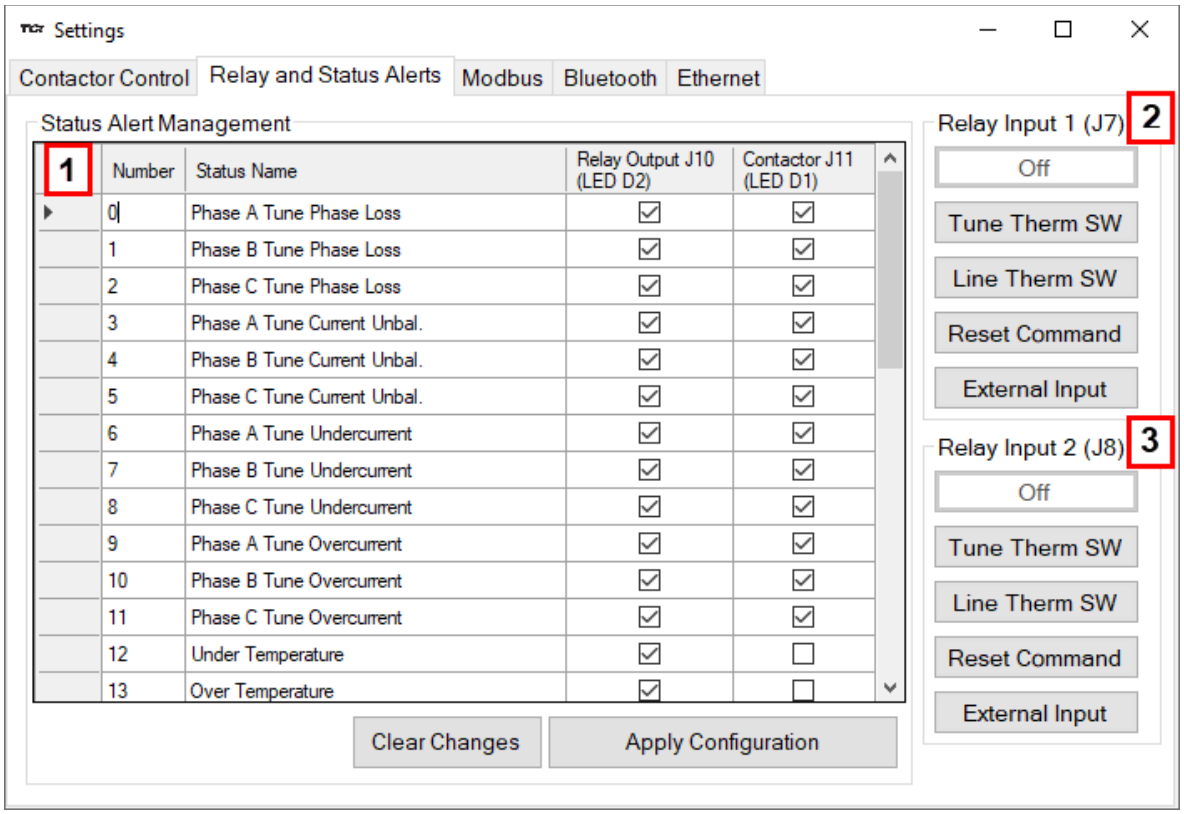


Figure 9: Relay and Status Settings Menu

Table 27: Relay and Status Settings Menu

Designators	Name	Description
1	**Status Alert Management**	**Enable and Disable status detections.** Depending on which status conditions the user would like to view. The column labeled Relay & LED will show the LED pattern of the status detection and send a warning. The column labeled Contactor will open the contactor if the selected status is checked and send the warning. **After selecting all desired status conditions, the user will need to select apply configuration and save settings.**
2	**Relay Input 1 (J7)**	Relay Inputs are based on how the board is connected to digital inputs. There is the option of having a thermal switch on the line reactor or tuning reactor. There is also an external control input option. • J7 of the PCB is configured as Relay input 1 • Select desired relay action if applicable and save settings.
3	**Relay Input 2 (J8)**	Relay Inputs are based on how the board is connected to digital inputs. There is the option of having a thermal switch on the line reactor or tuning reactor. There is also an external control input option. • J8 of the PCB is configured as Relay input 2 • Select desired relay action if applicable and save settings.

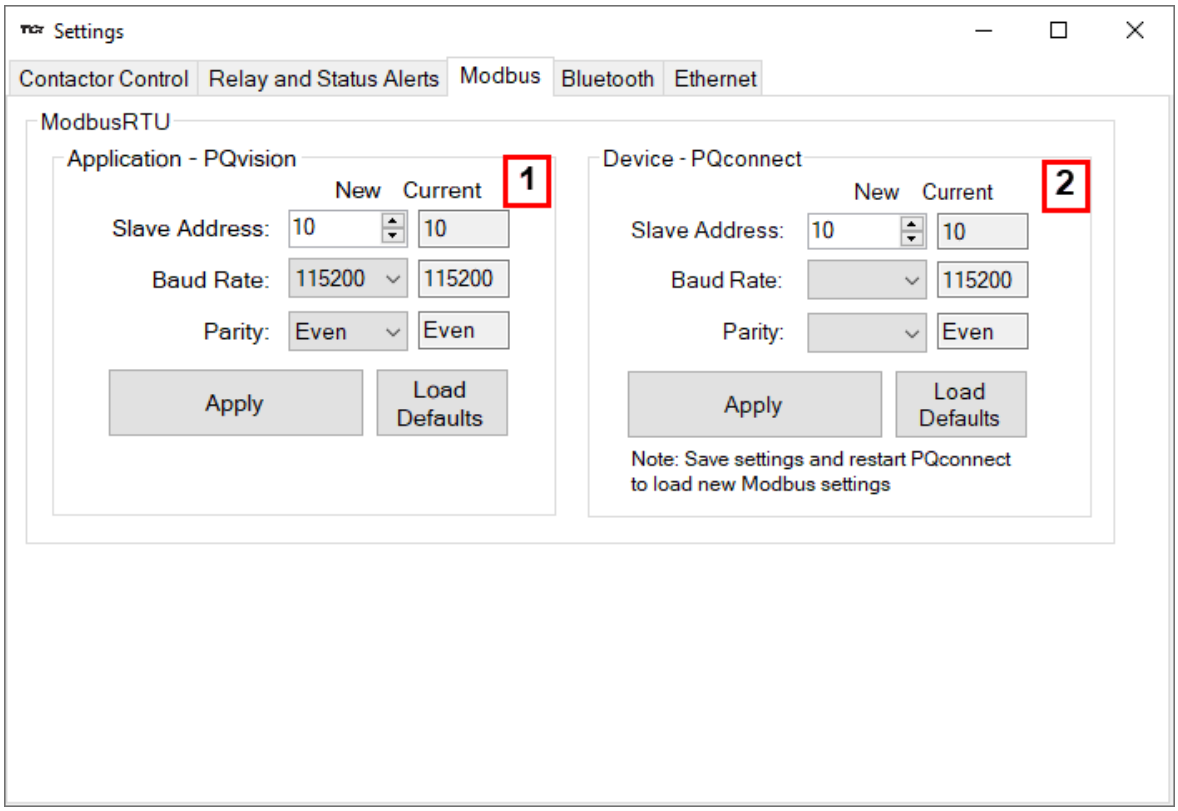


Figure 10: Modbus Settings Menu

Table 28: Modbus Settings Menu

Designators	Name	Description
1	**Application - PQvision**	Allows the user to change Modbus settings for **PQvision.** When changing the Modbus settings for the Application the user will have to select the apply button for the new settings to take effect.
2	**Device - PQconnect**	Allows the user to change Modbus settings of the **Device**. When changing Modbus settings of the device the user will select apply and save settings. Afterwards the user will need to reset the board, this can be done by selecting "**Reset PQconnect" from the drop-down menu.** **Note: After the user has changed the Modbus settings of the Device, they will need to change the PQvision App Modbus settings to reconnect.**

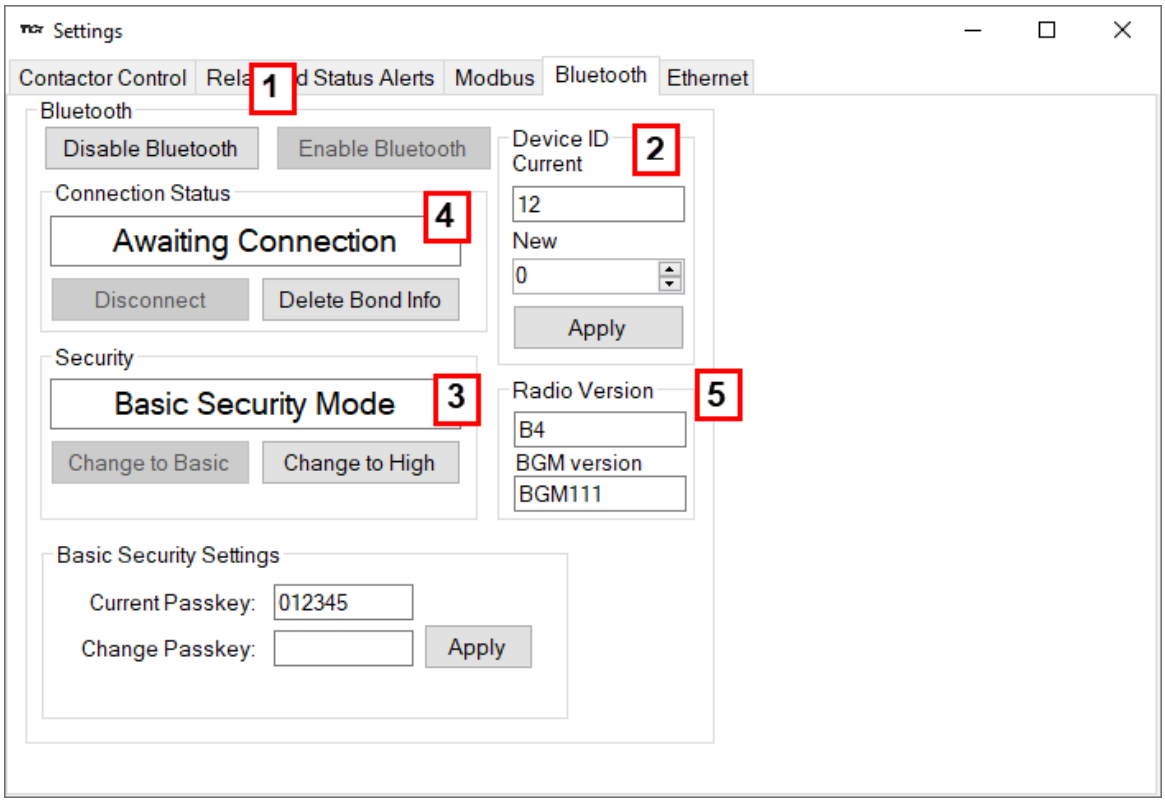


Figure 11: Bluetooth Settings Menu

Table 29: Bluetooth Settings Menu

Designators	Name	Description
1	**Bluetooth**	By default, Bluetooth will be enabled. Users can disable or enable the Bluetooth module at tech and factory access.
2	**Device ID**	Bluetooth numeric identifier, this numeric identifier allows PQvision mobile to identify different PQconnect boards within a 100-ft range. Please change the numeric ID to a unique numeric ID from a value of 0-99.
3	**Security**	There are two security modes the user can select. • High security Mode has the option of accepting and denying new connections to the device. • Basic security Mode has the option of changing the passkey if the user would like to change from the default values.
4	**Connection Status**	Connection status will determine if the device is paired with another device. To delete bonding info from a mobile device to your PQconnect board select the "**Delete Bond Info"** and save the PQconnect settings.
5	**Bluetooth Information**	Displays the Bluetooth firmware and hardware version that is being used by the PQconnect board.

****Make sure to Save settings after making all selections on your PQconnect board.**

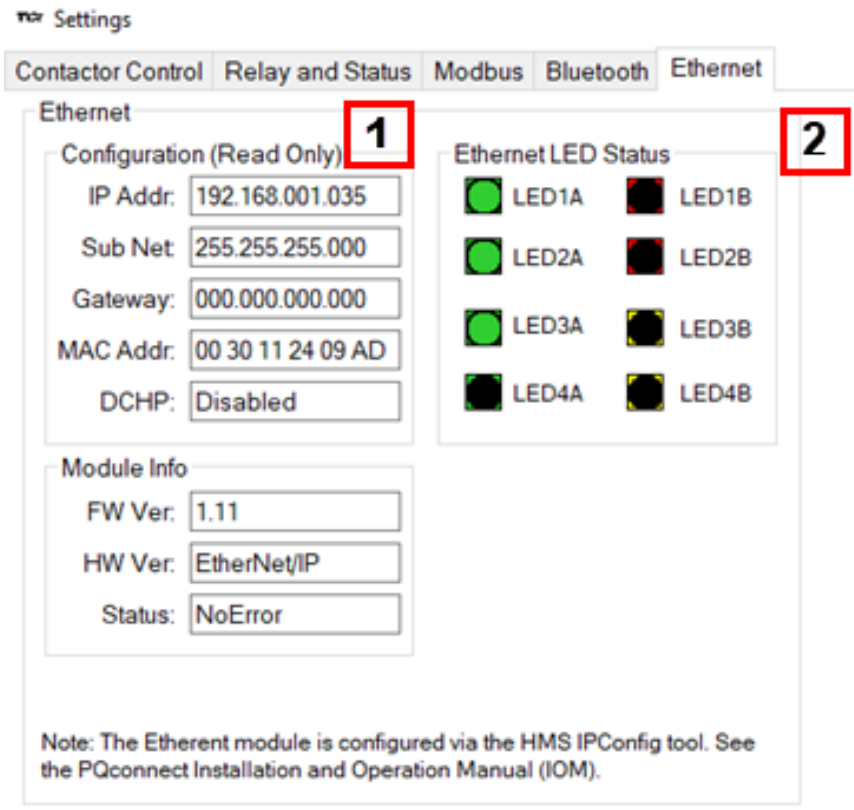


Figure 12: EtherNet/IP Settings Menu

Table 30: EtherNet/IP Settings Menu

Designators	Name	Description
1	**Configuration**	**Read Only** EtherNet/IP Configuration information about the PQconnect board. DHCP by default will be disabled. To configure IP Address, Sub net, and Gateway, please use the third-party utility application, HMS IPconfig provided by Anybus.
2	**LED Status**	The Anybus CompactCom 40 series supports four bicolored LED indicators. All LED outputs are active high and used by the host application. Refer to Figure 41: LED Status Codes for more information.

*For more information review sections: 6.0 PQconnect Troubleshooting.

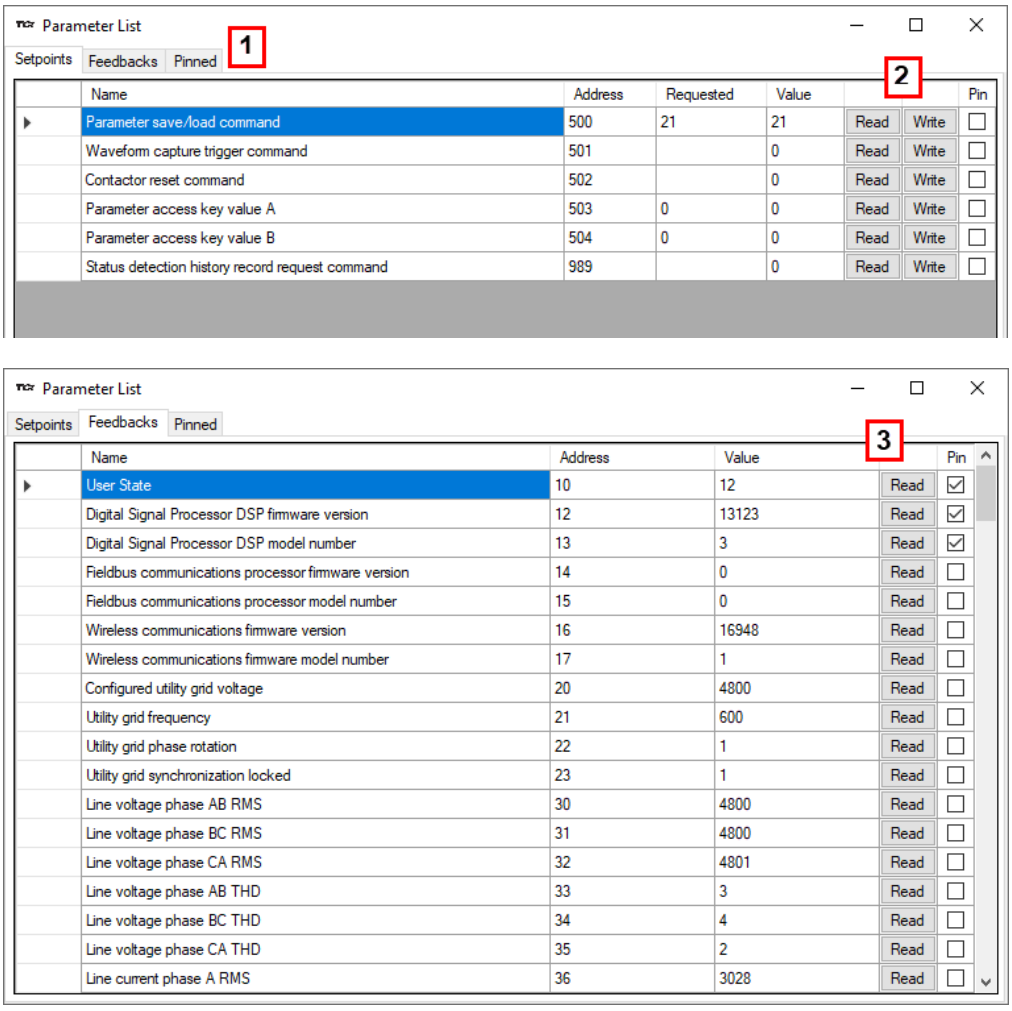


Figure 13: Parameter List

The parameter list allows the user to view feedback and setpoints reported by the PQconnect. The parameter list can be accessed by clicking **Parameter List** in the Menu drop down. To view the full parameter list, Tech Access will need to be enabled.

Table 31: Parameter List

Designators	Name	Description
1	**Setpoints and Feedbacks**	The Parameter List allows you to view both Setpoints (read and write values), and Feedbacks (read only values). The user can switch between the two by clicking the tab designator. Additionally, each of the setpoints and feedback can be viewed in the Pinned tab by clicking the corresponding checkbox in the *Pin* column.
2	**Setpoint Write**	The user can write values to the DSP setpoints by first entering a value into the *Requested* column, and then clicking the **Write** button. Once all desired setpoints are entered, save the settings by navigating to the main PQvision screen and clicking **Save Settings** in the menu drop down.
3	**Feedback Read**	The user can read values from the DSP feedbacks by clicking the **Read** button. This is helpful in order to help understand the current process in which the PQconnect board is at or parameter values that are being read from the PQconnect board.

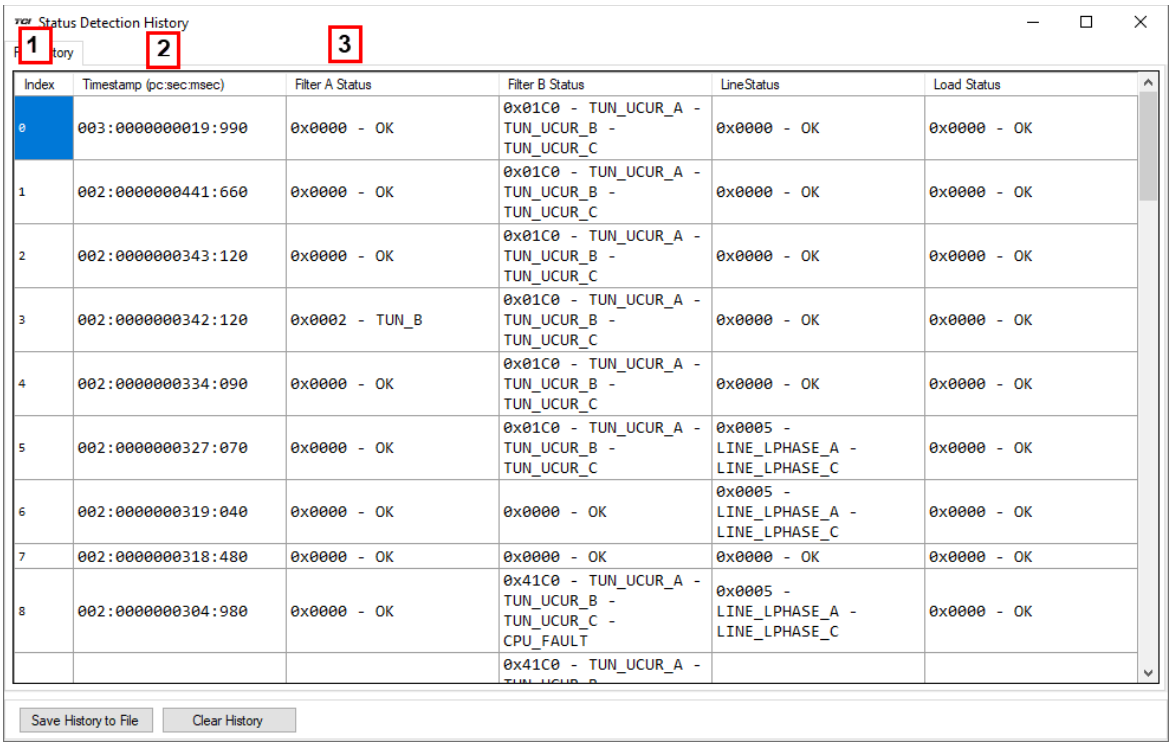


Figure 14 : Status Detection History

Table 32 : PQvision Status Detection History Menu

Designators	Name	Description
1	**Index**	Number of status conditions that occurred in the filter. Note: when reaching the 99 index any new status conditions will start to overwrite existing index's starting with index 0. The newest entry in the status history is always shown at the top of the history lists. The oldest entry will be at the bottom of the list.
2	**Timestamp (PC: sec: msec)**	The timestamp will indicate when a status condition was. detected. The first 3 numbers represent the number of times the board. power cycled when the event occurred. (PC) The middle 10 and last 3 digits represent the time in seconds: milliseconds format since the last power on of the PQconnect board since the status condition was detected.
3	**Filter Status**	Status will indicate the status detection that occurred. The status bit mask formatted as a hex value followed by a list of status conditions will be shown.

Example Application Using "Simply Modbus Master 8.1.0"

The Modbus RTU network interface port is configured for RS-485 signal levels. The following example uses an RS-485 to USB converter to connect the PQconnect to a laptop PC running the Modbus RTU master application. The picture below shows an example "B&B SmartWorx, Inc Model: USPTL4" model RS-422/485 converter. As another alternative RS-485 converter there is WINGONEER USB 2.0 to RS485 Serial Converter Adapter CP2104.

Figure 15: B&B SmartWorx, Inc Model: USPTL4 model RS-422/485 converter

With the example converter above, the user can make proper connections from the RS485 converter to the PQconnect J5 communication header. The table below indicates the positions where the RS485 connections lead to. Please ensure the correct dip switch settings are applied before installing.

Table 33: USPTL4 Converter to J5 Header Connections

J5 Header Pinout	B&B Converter USPTL4Pin Out	Signal Name	Signal Type
1	-	No connect	-
2	TDB(+)	D+	RS-485 B (non-inverting)
3	GND	GND	RS-485 SC/G
4	TDA(-)	D-	RS-485 A (inverting)
5	-	No connect	-

All four switches of the B&B converter from the factory should be set to the ON position and should look like the following.

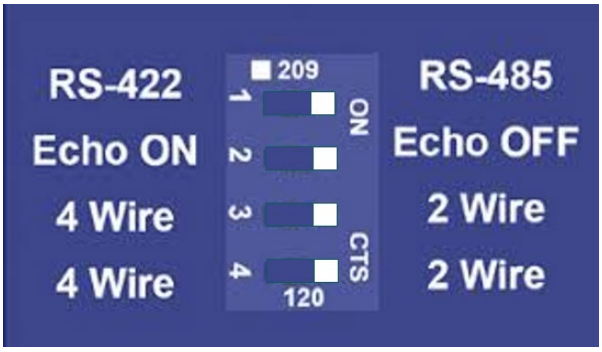


Figure 16: Dip Switch settings

Example Setup Instructions to Read Data from the PQconnect Unit

- Connect the cable to the “J5” communication header.
- Connect the USB end to the computer.
  - Determine the assigned COM port number for the RS-485 to USB converter using the computer device manager control panel.
  - The converter used in this example typically enumerates between the range of COM5 to COM20 on a standard laptop computer running the Microsoft windows operating system.
- Open the Simply Modbus Master software
  - Can be downloaded from the link below:
  - http://www.simplymodbus.ca/manual.htm
  - The trial version of the software is free and fully functional for this task hence no License key is necessary.
- Next, configure the fields in the screen as shown below. These are again the default settings of the PQconnect COM port.
  - Note: The “notes” section of the display data registers is filled in manually

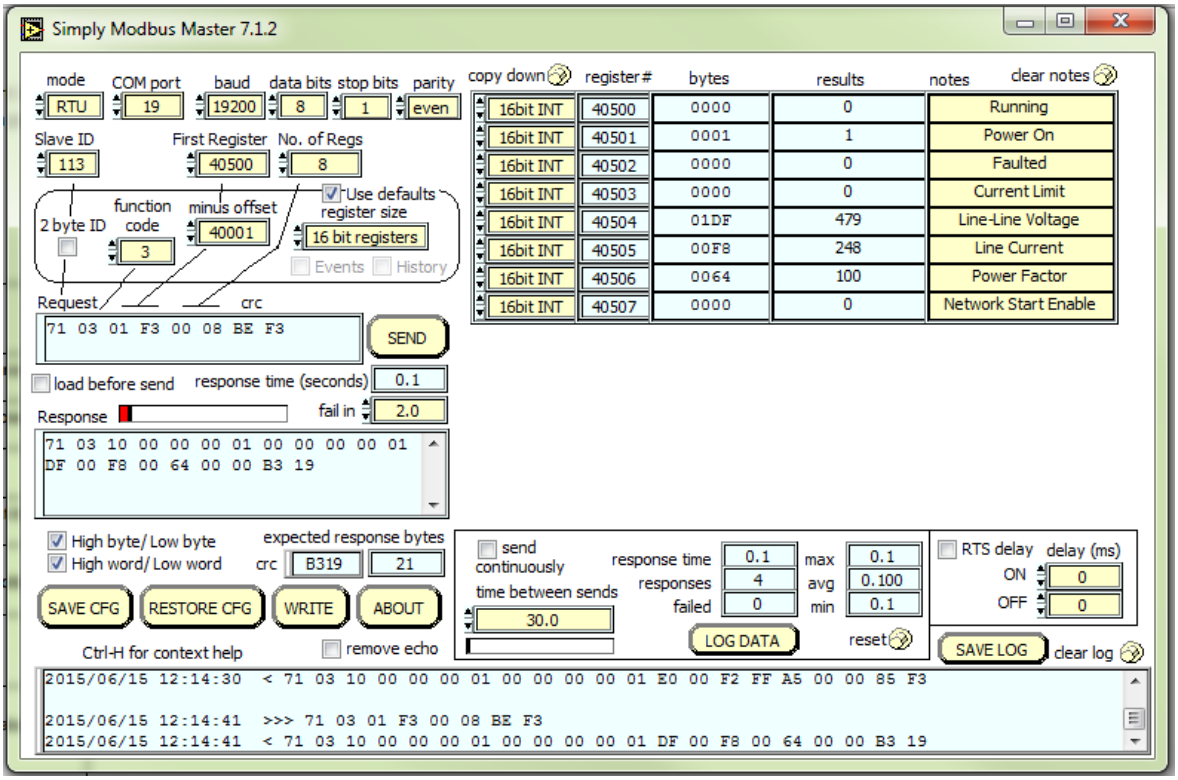


Figure 17: Example Setup Instructions to Write Data to the PQconnect Unit

- To control the contactor in the unit, first the user will need tech access by writing the parameter keys.
  - Navigate to the settings menu and then select the force open or force close button.
  - The contactor state box will indicate if the contactor is open or closed.
- Next, select the “WRITE” button on the screen shown above.
- The screen below will be shown. Configure the fields as shown in the picture.

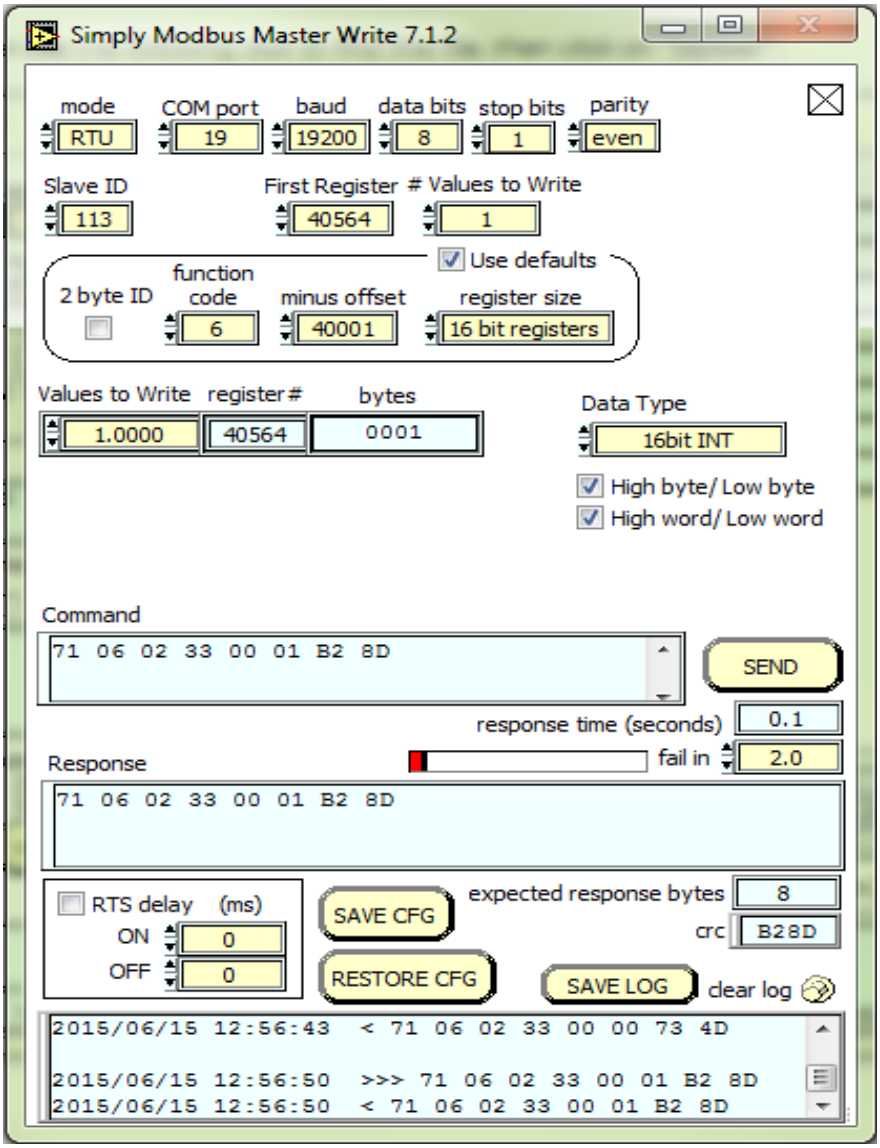


Figure 18: WRITE Screen

- Select “0” in the field “Values to Write” to close the contactor or “1” to open the contactor.

PQconnect Quick Start Unit Software Setup

- Verify connections to the PCB via ModbusRTU over RS485 before filter is energized.
- Download PQvision software found on our website: https://transcoil.com/products/pqvision-software/
- Enter password: **08252014** to access software package.
- Select communication port (Data should be shown after the board communicates)
  - Note: Default Modbus settings of the application are below.
  - Baud rate: 115200
  - Parity: Even
  - Slave Address: 10
  - See Figure 10: Modbus Settings Menu for changing the default settings.

Modbus RTU Register Map

The input and output registers from the HarmonicGuard Passive filter are mapped to the Modbus Analog Output Holding Registers starting at address 40000 to 49999 and Analog Input Registers starting at address 30000 to 39999. Parameter Tables shown below are broken down into parameter groups with a size of 16 bits. Please note that the Register Map tables may not match the EDS file groups parameters and some parameters may only be kept in reservation for future use. All Feedback Register Parameters are read-only, while All Setpoint Register Parameters are Read/Write Parameters.

Feedbacks Register Map

Parameter Name	I/O Register Address Offsets	Description	Notes
USER_STATE	10	User State	User State Parameter 00 = INIT_START 01 = INIT_DELAY 02 = INIT_E2_CHIP 03 = INIT_FLASH_TEST 04 = WRITE_FLASH_TEST 05 = SETUP_FLASH 06 = SETUP_NON_CAL_FLASH 07 = SAVE_CURRENT_VALUES 08 = STAMP_EE 09 = INIT_FROM_DEFAULTS 10 = INIT_FROM_FLASH 11 = EXECUTE_PARAM_FUNCTIONS 12 = PARAM_INIT_FINISH 13 = RESTORE_DEFAULTS 14 = RESTORE_NON_CAL_DEFAULTS 15 = INIT_SAVE_CURRENT_VALUES 16 = REBOOT 17 = SETUP_UNIT_CAL_FLASH 18 = RESTORE_UNIT_CAL_DEFAULTS 19 = UPDATE_EEPROM 20 = UNPROTECT_EEPROM 21 = PROTECT_EEPROM
DSP_SW_VER	12	Digital Signal Processor DSP firmware version	Software Revision Code for Processor Two 8bit ASCII characters 0x0141 = ASCII for "A1"
DSP_MODEL_NUM_RO	13	Digital Signal Processor DSP model number	System Model Numbers 0 = Undefined 3 = Sim 101 = HSD 102 = HGL 103 = HGP 104 = HSL 105 = HSE 200 = KIT - BLANK 202 = KIT - HGL 203 = KIT - HGP 205 = KIT - HSE
HMS_SW_VER	14	Fieldbus communications processor firmware version	Ethernet Module Model Number
HMS_MODEL_NUM_RO	15	Fieldbus communications processor model number	Ethernet Hardware Version Number Notifies the user what type of Module is connected.
BGM_SW_VER	16	Wireless communications firmware version	Software Revision Code for Bluetooth Processor Two 8bit ASCII characters 0x4234 = ASCII for "4B"

BGM_MODEL_NUM_RO	17	Wireless communications firmware model number	Module Revision Code for Bluetooth Processor 0 = Null 1 = BGM111 2 = BGM210 3 = BGM220
LINE_VOLTAGE	20	Configured Utility Grid Voltage	Filter Input Voltage 4800 = 480.0
LINE_FREQ	21	Utility grid frequency	Filter Input Frequency 500 = 50.0
LINE_ROT	22	Utility grid phase rotation	Filter Input Phase Orientation 1 = ABC Rotation Expected 2 = ACB Rotation Expected
LINE_LOCK	23	Utility grid synchronization locked	Filter Utility Grid Synchronous Locked (PLL) 0 = Not Locked 1 = Locked
V_LINE_AB_RMS	30	Line Voltage Phase AB RMS	Source Utility Line Phase to Phase Voltage (A-B) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_LINE_BC_RMS	31	Line Voltage Phase BC RMS	Source Utility Line Phase to Phase Voltage (B-C) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_LINE_CA_RMS	32	Line Voltage Phase CA RMS	Source Utility Line Phase to Phase Voltage (C-A) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_LINE_AB_THD	33	Line Voltage Phase AB THD	Source Utility Line Phase to Phase Voltage (A-B) THD 10 = 1.0%
V_LINE_BC_THD	34	Line Voltage Phase BC THD	Source Utility Line Phase to Phase Voltage (B-C) THD 10 = 1.0%
V_LINE_CA_THD	35	Line Voltage Phase CA THD	Source Utility Line Phase to Phase Voltage (C-A) THD 10 = 1.0%
I_LINE_A_RMS	36	Line Current Phase A RMS	Source Utility Line Phase to Phase Current (A) 1002 = 100.2 Arms Range: 0 to 1000 Arms
I_LINE_B_RMS	37	Line Current Phase B RMS	Source Utility Line Phase to Phase Current (B) 1002 = 100.2 Arms Range: 0 to 1000 Arms
I_LINE_C_RMS	38	Line Current Phase C RMS	Source Utility Line Phase to Phase Current (C) 1002 = 100.2 Arms Range: 0 to 1000 Arms
I_LINE_A_THD	39	Line Current Phase A THD	Source Utility Line Phase to Phase Current (A) THD 10 = 1.0%

I_LINE_B_THD	40	Line Current Phase B THD	Source Utility Line Phase to Phase Current (B) THD 10 = 1.0%
I_LINE_C_THD	41	Line Current Phase C THD	Source Utility Line Phase to Phase Current (C) THD 10 = 1.0%
I_LINE_A_TDD	42	Filter Input Total Demand Distortion Phase A Current TDD	Source Utility Total Demand Distortion Phase A 10 = 1.0%
I_LINE_B_TDD	43	Filter Input Total Demand Distortion Phase B Current TDD	Source Utility Total Demand Distortion Phase B 10 = 1.0%
I_LINE_C_TDD	44	Filter Input Total Demand Distortion Phase C Current TDD	Source Utility Total Demand Distortion Phase C 10 = 1.0%
V_LOAD_AB_RMS	50	Load Voltage Phase AB RMS	Filter Output Phase to Phase Voltage (A-B) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_LOAD_BC_RMS	51	Load Voltage Phase BC RMS	Filter Output Phase to Phase Voltage (B-C) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_LOAD_CA_RMS	52	Load Voltage Phase CA RMS	Filter Output Phase to Phase Voltage (C-A) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_LOAD_AB_THD	53	Load Voltage Phase AB THD	Filter Output Phase to Phase Voltage THD (A-B) 10 = 1.0%
V_LOAD_BC_THD	54	Load Voltage Phase BC THD	Filter Output Phase to Phase Voltage THD (B-C) 10 = 1.0%
V_LOAD_CA_THD	55	Load Voltage Phase CA THD	Filter Output Phase to Phase Voltage THD (C-A) 10 = 1.0%
I_LOAD_A_RMS	56	Load Current Phase A RMS	Filter Output Phase to Phase Current (A) 920 = 92.0 Arms Range: 0 to 1000 Arms
I_LOAD_B_RMS	57	Load Current Phase B RMS	Filter Output Phase to Phase Current (B) 920 = 92.0 Arms Range: 0 to 1000 Arms
I_LOAD_C_RMS	58	Load Current Phase C RMS	Filter Output Phase to Phase Current (C) 920 = 92.0 Arms Range: 0 to 1000 Arms
I_LOAD_A_THD	59	Load Current Phase A THD	Filter Output Phase to Phase Current (A) THD 10 = 1.0%

I_LOAD_B_THD	60	Load Current Phase B THD	Filter Output Phase to Phase Current (B) THD 10 = 1.0%
I_LOAD_C_THD	61	Load Current Phase C THD	Filter Output Phase to Phase Current (C) THD 10 = 1.0%
V_TUNE_A_RMS	70	Tuned Circuit Voltage Phase AB RMS	Filter Tune Phase to Phase Voltage (A-B) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_TUNE_B_RMS	71	Tuned Circuit Voltage Phase BC RMS	Filter Tune Phase to Phase Voltage (B-C) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_TUNE_C_RMS	72	Tuned Circuit Voltage Phase CA RMS	Filter Tune Phase to Phase Voltage (C-A) 4800 = 480.0 Vrms Range: 0 to 1000 Vrms
V_TUNE_A_THD	73	Tuned Circuit Voltage Phase AB THD	Filter Tune Phase to Phase Voltage THD (A-B) 10 = 1.0%
V_TUNE_B_THD	74	Tuned Circuit Voltage Phase BC THD	Filter Tune Phase to Phase Voltage THD (B-C) 10 = 1.0%
V_TUNE_C_THD	75	Tuned Circuit Voltage Phase CA THD	Filter Tune Phase to Phase Voltage THD (C-A) 10 = 1.0%
I_TUNE_A_RMS	76	Tuned Circuit Current Phase A RMS	Filter Tune Phase to Phase Current (A) 920 = 92.0 Arms Range: 0 to 1000 Arms
I_TUNE_B_RMS	77	Tuned Circuit Current Phase B RMS	Filter Tune Phase to Phase Current (B) 920 = 92.0 Arms Range: 0 to 1000 Arms
I_TUNE_C_RMS	78	Tuned Circuit Current Phase C RMS	Filter Tune Phase to Phase Current (C) 920 = 92.0 Arms Range: 0 to 1000 Arms
I_TUNE_A_THD	79	Tuned Circuit Current Phase A THD	Filter Tune Phase to Phase Current (A) THD 10 = 1.0%
I_TUNE_B_THD	80	Tuned Circuit Current Phase B THD	Filter Tune Phase to Phase Current (B) THD 10 = 1.0%
I_TUNE_C_THD	81	Tuned Circuit Current Phase C THD	Filter Tune Phase to Phase Current (C) THD 10 = 1.0%
P_LINE_APPARENT_TOTAL	100	Line apparent power, (kVA)	Total Filter input apparent power. Range: 0 to 1000 kVA
P_LINE_REAL_TOTAL	101	Line real power, (kW)	Total Filter input real power. Range: 0 to 1000 kW
P_LINE_REACTIVE_TOTAL	102	Line reactive power, (kVAR)	Total Filter input reactive power: Negative number indicates inductive power. Positive number indicates capacitive power. Range: -1000 to 1000 kVAR

P_LINE_POWER_FACTOR	103	Line power factor, (%)	Filter input Displacement Power Factor Negative value indicates lagging power factor. 1,000 = 1.00 Unity PF -950 = 0.95 Lagging PF 950 = 0.95 Leading PF Range: -1000 to 1000
P_LOAD_APPARENT_TOTAL	120	Load apparent power, (kVA)	Total Filter output apparent power Range: 0 to 1000 kVA
P_LOAD_REAL_TOTAL	121	Load real power, (kW)	Total Filter output real power Range: 0 to 1000 kW
P_LOAD_REACTIVE_TOTAL	122	Load reactive power, (kVAR)	Total Filter output reactive power: Negative number indicates inductive power. Positive number indicates capacitive power Range: -1000 to 1000 kVAR
P_LOAD_POWER_FACTOR	123	Load power factor, (%)	Filter output Displacement Power Factor Negative values indicate lagging power factor. 1,000 = 1.00 Unity PF -950 = 0.95 Lagging PF 950 = 0.95 Leading PF Range: -1000 to 1000
P_LOAD_REAL_MEAS	124	Measured Load real power, (kW)	
I_LINE_A_HARM_1	140	Line Current Fundamental Phase A	**Not EtherNet Enabled** 10 = 1.0% Range: 0 to 100 %
I_LINE_A_HARM_3	141	Line Current 3rd Harmonic Phase A	
I_LINE_A_HARM_5	142	Line Current 5th Harmonic Phase A	
I_LINE_A_HARM_7	143	Line Current 7th Harmonic Phase A	
I_LINE_A_HARM_11	144	Line Current 11th Harmonic Phase A	
I_LINE_A_HARM_13	145	Line Current 13th Harmonic Phase A	**Not EtherNet Enabled** 10 = 1.0% Range: 0 to 100 %

I_LINE_A_HARM_17	146	Line Current 17th Harmonic Phase A	**Not EtherNet Enabled** 10 = 1.0% Range: 0 to 100 %
I_LINE_A_HARM_19	147	Line Current 19th Harmonic Phase A	
I_LINE_A_HARM_23	148	Line Current 23rd Harmonic Phase A	
I_LINE_A_HARM_25	149	Line Current 25th Harmonic Phase A,	
I_LINE_B_HARM_1	160	Line Current Fundamental Phase B	**Not EtherNet Enabled** 10 = 1.0% Range: 0 to 100 %
I_LINE_B_HARM_3	161	Line Current 3rd Harmonic Phase B	
I_LINE_B_HARM_5	162	Line Current 5th Harmonic Phase B	
I_LINE_B_HARM_7	163	Line Current 7th Harmonic Phase B	
I_LINE_B_HARM_11	164	Line Current 11th Harmonic Phase B	
I_LINE_B_HARM_13	165	Line Current 13th Harmonic Phase B	**Not EtherNet Enabled** 10 = 1.0% Range: 0 to 100 %
I_LINE_B_HARM_17	166	Line Current 17th Harmonic Phase B	
I_LINE_B_HARM_19	167	Line Current 19th Harmonic Phase B	
I_LINE_B_HARM_23	168	Line Current 23rd Harmonic Phase B	
I_LINE_B_HARM_25	169	Line Current 25th Harmonic Phase B	
I_LINE_C_HARM_1	180	Line Current Fundamental Phase C	**Not EtherNet Enabled** 10 = 1.0% Range: 0 to 100 %
I_LINE_C_HARM_3	181	Line Current 3rd Harmonic Phase C	
I_LINE_C_HARM_5	182	Line Current 5th Harmonic Phase C	
I_LINE_C_HARM_7	183	Line Current 7th Harmonic Phase C	
I_LINE_C_HARM_11	184	Line Current 11th Harmonic Phase C	
I_LINE_C_HARM_13	185	Line Current 13th Harmonic Phase C	**Not EtherNet Enabled** 10 = 1.0% Range: 0 to 100 %
I_LINE_C_HARM_17	186	Line Current 17th Harmonic Phase C	

I_LINE_C_HARM_19	187	Line Current 19th Harmonic Phase C	**Not EtherNet Enabled** 10 = 1.0% Range: 0 to 100 %
I_LINE_C_HARM_23	188	Line Current 23rd Harmonic Phase C	
I_LINE_C_HARM_25	189	Line Current 25th Harmonic Phase B	
CNT_CLOSED	200	Filter Tuned Circuit Contactor closed	Indicates the status of the Filters tuned circuit contactor. 0 = Contactor Closed 1 = Contactor Open
SYS_POWER_ON	201	Filter Powered On	Indicates if the filter has input power available 0 = Power Off 1 = Power On
SYS_STATUS_OK	202	Filter Status OK	Indicates filters status 0 = Filter is operating 1 = Filter has indicated status warning
SYS_AT_CAPACITY	203	Filter at Maximum Capacity	Indicates if the filter is running at its maximum current capacity 0 = Nominal 1 = At Capacity
T_AMBIENT	204	Filter Controls Temperature	Board will give a status condition of overtempt if it exceeds 75C or under-temp if the temperature descends past -40C Range: -75C to 75C
STATUS_FILTER_A	210	Filter Status Detection Active A Bit Mask	Reference Filter Status Table in IOM Read only display of the Filter Status detection for register A bit mask. Notifies the user of any current faults Range: 0 to 65535
STATUS_FILTER_B	211	Filter Status Detection Active B Bit Mask	
STATUS_LINE	212	Line Status Detection Active Bit Mask	Reference Filter Status Table in IOM Read only display of the Filter Line detection register bit mask. Notifies the user of any current faults Range: 0 to 65535
STATUS_FILTER_LOAD	213	Filter Load Status Detection Bit Mask	Reference Filter Status Table in IOM Read only display of the Filter Load detection register bit mask. Notifies the user of any current faults Range: 0 to 65535

STATUS_FILTER_A_ENABLE_RO	220	Filter Status A Detection Enable Bit Mask	Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_B_ENABLE_RO	221	Filter Status B Detection Enable Bit Mask	
STATUS_LINE_ENABLE_RO	222	Line Status Detection Enable Bit Mask	Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_LOAD_ ENABLE_RO	223	Filter Load Status Detection Enable Bit Mask	Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_A_ RELAY_ACTION_RO	230	Filter Status A Relay Action Enable Bit Mask	**Not EtherNet Enabled** Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_B_ RELAY_ACTION_RO	231	Filter Status B Relay Action Enable Bit Mask	
STATUS_LINE_RELAY_ ACTION_RO	232	Line Status Relay Action Enable Bit Mask	**Not EtherNet Enabled** Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_LOAD_ RELAY_ACTION_RO	233	Filter Load Status Relay Action Enable Bit Mask	**Not EtherNet Enabled** Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_A_ CNT_ACTION_RO	240	Filter Status A Tune Contactor Action Enable Bit Mask	**Not EtherNet Enabled** Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_B_ CNT_ACTION_RO	241	Filter Status B Tune Contactor Action Enable Bit Mask	
STATUS_LINE_CNT_ACTION_RO	242	Line Status Tune Contactor Action Enable Bit Mask	**Not EtherNet Enabled** Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535

STATUS_FILTER_LOAD_ CNT_ACTION_RO	243	Filter Load Status Tune Contactor Action Enable Bit Mask	**Not EtherNet Enabled** Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
SYS_CONTROL_MODE_RO	250	Control Mode	**Not EtherNet Enabled** Read Only of the Contactor Control Mode Allows the user to keep the contactor always off/on, auto turn on/off based on desired load percentage or kVAR, external relay input, in debug close mode. 0 = Always Open 1 = Always Closed 2= Auto load 3 = Auto kVAR 4 = External Control Input 5 = No contactor 6 = Diagnostic Always Close
TRACE_GO_DONE_RO	251	Capture GO/DONE command (set to start capture)	**Not EtherNet Enabled** Indicates whether waveform data is being captured 0 = Capture Done 1 = Start Capture
SYS_AUTO_FAULT_RESET_RO	252	Enable Auto Fault Clear/Re Start	**Not EtherNet Enabled** Displays auto contactor reset 0 = Disabled 1 = Enabled
CT_RATIO_RO	253	Line/Load Current CT Ratio	**Not EtherNet Enabled** Dual Turned Circuit Current Transformer (CT) ratios. **Note**: Only required for units with two tuned circuits. XXXX:5 where XXXX is the primary turns count of the CT in tenths. 100 = 1000:5 50 = 500:5 Range 5 to 10000

PARAM_ACCESS_LEVEL_RO	254	Parameter access level	**Ethernet Enabled but Mapped to Ethernet Instance: DiagFB7** Determines the Level of parameter access to read and/or change parameter inputs 0 = Base access 1 = Tech access 2 = Factory access
PARAM_STATE	255	Parameter state	Indicates the present state of the parameter state machine. 00 = INIT_START 01 = INIT_DELAY 02 = INIT_E2_CHIP 03 = INIT_FLASH_TEST 04 = WRITE_FLASH_TEST 05 = SETUP_FLASH 06 = SETUP_NON_CAL_FLASH 07 = SAVE_CURRENT_VALUES 08 = STAMP_EE 09 = INIT_FROM_DEFAULTS 10 = INIT_FROM_FLASH 11 = EXECUTE_PARAM_FUNCTIONS 12 = PARAM_INIT_FINISH 13 = RESTORE_DEFAULTS 14 = RESTORE_NON_CAL_DEFAULTS 15 = INIT_SAVE_CURRENT_VALUES 16 = REBOOT 17 = SETUP_UNIT_CAL_FLASH 18 = RESTORE_UNIT_CAL_DEFAULTS 19 = UPDATE_EEPROM 20 = UNPROTECT_EEPROM 21 = PROTECT_EEPROM
SYS_STATE	256	System state	Indicates the present state of the system state machine (Read Only) 00 = Initialization State Machine 01 = Initialization Parameters 02 = Power on Delay 03 = Unit Self State Configuration Check 04 = Reset 05 = Force Open Contactor 06 = Force Close Contactor 07 = Auto Load Open 08 = Auto Load Close 09 = Auto kVAR Close 10 = Auto kVAR Open 11 = External Open 12 = External Close 13 = No Contactor 14 = Contactor Closed Inhibited 15 = Calibrate offsets 16 = Calibrate Magnitude 17 = No Communication 18 = Communication configuration 19 = PCB Calibration Check 20 = Unit Calibration Check 21 = Pre-Calibration Check 22 = Unit in Contactor Debug Close State

CNT_STATUS	257	Contactor command status	Indicates the present contactor status command. 00 = Init State at Startup 01 = Force Close Condition 02 = Force Open Condition 03 = Auto Load Open Condition 04 = Auto kVAR Open Condition 05 = External Open Condition 06 = No Contactor Condition 07 = Contactor Open 08 = Contactor Param Inhibit 09 = Contactor Power On Inhibit 10 = Contactor Calibrate Inhibit 11 = Contactor Min Reclose 12 = Contactor Close Delay 13 = Contactor Auto Reclose Delay 14 = Contactor Auto Reclose Limit 15 = Contactor Config Inhibit
RATED_VOLTAGE_RO	260	Unit Rated Voltage	**Not EtherNet Enabled** Filter's Rated Voltage 4800 = 480.0 Vrms Range: 120 to 690 Vrms
RATED_CURRENT_RO	261	Unit Rated Current	**Not EtherNet Enabled** Filter's rated Current 1255 = 125.5 Arms Range: 3 to 1500 Arms
RATED_FREQUENCY_RO	262	Unit Rated Frequency, (Hz)	**Not EtherNet Enabled** Filter's Rated Frequency 60 = 60Hz
CNT_CLOSE_LOAD_ THRESHOLD_RO	270	Contactor Close Threshold for Load Control, (% rated current)	**Not EtherNet Enabled** Contactor Close Threshold based on the load. Default: 30 = 30% Range: 10 to 100%
CNT_CLOSE_LOAD_ HYSTERESIS_RO	271	Contactor Close/Open Hysteresis for Load Control, (% rated current)	**Not EtherNet Enabled** Contactor will open/reclose when it reaches the hysteresis percentage If Contactor threshold is set 50% and this parameter is set to 5%, the contactor will reclose when the load reaches 55% load. Default: 5 = 5% Range: 2 to 50%
CNT_CLOSE_KVAR_ THRESHOLD_RO	272	Contactor Close Threshold for kVAR Control, (kVAR)	**Not EtherNet Enabled** Contactor close threshold for kVAR control Range: 0 to 1,000 kVAR
CNT_CLOSE_KVAR_ HYSTERESIS_RO	273	Contactor Close/Open Hysteresis for kVAR Control, (kVAR)	**Not EtherNet Enabled** Contactor will open when it reaches the hysteresis percentage Default: 10 = 10% Range: 5% to 100%

CNT_CLOSE_DELAY_RO	274	Contactor Close Delay, (sec)	**Not EtherNet Enabled** Displays set value of contactor closed delay time Default: 5 seconds Range: 1 to 3600 seconds
CNT_OPEN_DELAY_RO	275	Contactor Open Delay, (sec)	**Not EtherNet Enabled** Displays set value of contactor open delay time Default: 5 seconds Range: 1 to 3600 Seconds
CNT_AUTO_RECLOSE_ DELAY_RO	280	Contactor Auto Re-Close Delay Time, (sec)	**Not EtherNet Enabled** Indicates contactor auto reclose delay time Default: 300 seconds Range: 120 to 36000 seconds
CNT_POWER_ON_DELAY_RO	281	System Power On Start Delay, (sec)	**Not EtherNet Enabled** Indicates contactors power on delay time, the amount of time to expire after reboot. Default: 0 seconds Range: 0 to 3600 seconds
CNT_AUTO_RECLOSE_ ATTEMPTS_RO	282	Contactor Auto Re-Close Number Attempts Allowed	**Not EtherNet Enabled** Indicates the max number of reclose attempts of contactor when the internal contactor has Auto Reset Enabled. Default: 5 attempts Range: 1 to 15
CNT_AUTO_RECLOSE_ TIMESPAN_RO	283	Contactor Auto Re-Close Max Attempt Time Span, (Sec)	**Not EtherNet Enabled** Displays the time interval for the number reclose attempts to reset. Default: 1800 seconds Range: 300 to 3600 seconds
SYS_AUTO_RECLOSE_ TIMER_RO	284	Contactor Auto Re-Close Timer Present Value, (sec)	**Not EtherNet Enabled** Displays count down time for contactor to reclose timespan. Default: 1800 seconds Range: 300 to 3600 seconds
SYS_CNT_MIN_OFF_TIME_RO	285	Minimum Off Time for Contactor Re-Closures, (sec)	**Not EtherNet Enabled** Minimum time off for contactor re-closures Default: 60 seconds Range: 30 to 300 seconds
SYS_CNT_MIN_OFF_TIMER	286	Seconds Remaining on Min Off Timer for Contactor Re-Closures, (sec)	**Not EtherNet Enabled** Displays count down time for contactor re-closures. Once this timer expires contactor will change the contactor state to close. Default: 60 seconds Range: 30 to 300 seconds

MB_SLAVE_ADDRESS_RO	300	Modbus Slave Address	**Not EtherNet Enabled** Modbus Slave Address Default: 10 Range: 0 to 255
MB_BAUD_RATE_RO	301	Line Current Estimation Decay Phase A, (bits per second)	**Not EtherNet Enabled** Modbus Baud Rate 11520 = 115200 baud rate 960 = 9600 baud rate 3840 = 38400 baud rate
MB_PARITY_RO	302	Modbus Parity	**Not EtherNet Enabled** 0 = None 1 = Odd 2 = Even
RELAY_INPUT_STATUS	320	Digital Relay Input Status	Filter Relay Input Status, 0b00 = Relay 1 (Temp Okay), Relay 2 (Temp Okay) 0b01 = Relay 1 (Temp Hot), Relay 2 (Temp Okay) 0b10 = Relay 1 (Temp Okay), Relay 2 (Temp Hot) 0b11 = Relay 1 (Temp Hot), Relay 2 (Temp Hot)
RELAY_INPUT_1_CONFIG_RO	321	Digital Input 1 Configuration	**Not EtherNet Enabled** Customer External Control Input 1 Read-Only: J7 of the PCB 0 = Disabled 1 = Tuning Reactor Thermal Switch Input 2 = Line Reactor Thermal Switch Input 3 = Reset Command 4 = External Control Input
RELAY_INPUT_2_CONFIG_RO	322	Digital Input 2 Configuration	**Not EtherNet Enabled** Customer External Control Input 2 Read-Only: J8 of the PCB 0 = Disabled 1 = Tuning Reactor Thermal Switch Input 2 = Line Reactor Thermal Switch Input 3 = Reset Command 4 = External Control Input
SYS_SERIAL_NUM_2_RO	350	MS Portion of Job # of Unit Serial #	**Not EtherNet Enabled** Unit serial number section - upper 16 bits of 32-bit unit job number Parameter contains UUUU in the UUUULLLL-NN serial number format.

SYS_SERIAL_NUM_1_RO	351	LS Portion of Job # of Unit Serial #	**Not EtherNet Enabled** Unit serial number section - lower 16 bits of 32-bit unit job number Parameter contains LLLL in the UUUULLLL-NN serial number format.
SYS_SERIAL_NUM_0_RO	352	Line # of Unit Serial #	**Not EtherNet Enabled** Unit serial number section - two-digit unit number Parameter contains NN in the UUUULLLL- NN serial number format.
PCB_SERIAL_NUM_1_RO	353	MS Portion of PCB Serial #	**Not EtherNet Enabled** PCB serial number section - upper 16 bits of 32-bit unit job number Parameter contains UUUU in the UUUULLLL-NNN serial number format.
PCB_SERIAL_NUM_0_RO	354	LS Portion of PCB Serial #	**Not EtherNet Enabled** PCB serial number section - lower 16 bits of 32-bit unit job number Parameter contains LLLL in the UUUULLLL-NNN serial number format.
PCB_TEST_NUM_RO	355	Test Number of the PCB Serial Number	**Not EtherNet Enabled** PCB serial number section - three-digit unit number Parameter contains NNN in the UUUULLLL- NNN serial number format.
SYS_DS_MODE	360	Data Simulation Mode Active	Indicates if the PQconnect board is in data simulation mode 0 = Not in Data Sim Mode 1 = Data Sim Mode
CONFIG_MODE_ACTIVE	365	Active Feedback Sensing Configuration Mode	Indicates PQconnect board current sensing mode. 0 = Config Sensing Mode Null (Error) 1 = Config Sensing Mode is Auto Selecting (Current detecting its sensing mode) 2 = Config Sensing Mode is ABC (Uses all 3 phases for sensing, 8 op-amp configuration) 3 = Config Sensing Mode is AC (Uses Phase A and C for sensing, uses 6 op-amp configuration)

BGM_PASSKEY_A	375		**Ethernet Enabled but Mapped to Ethernet Instance: DiagFB1** Read only Value of BGM Password - High Bytes Range: 0 to 65535
BGM_PASSKEY_B	376		**Ethernet Enabled but Mapped to Ethernet Instance: DiagFB2** Read Only value of BGM password set low bytes. Range: 0 to 65535
BGM_SECUIRTY_LEVEL_RO	377	Wireless Security level	**Not EtherNet Enabled** BGM Security level. High Security mode blocks new pairing requests. Passkey changes each time a connection is attempted. 0 = Low Security 1 = High Security
BGM_NUMERIC_ID_RO	378	Wireless Numeric Identifier	**Not EtherNet Enabled** Read only value of BGM Numeric ID Default: 0
BGM_PAIRING_MODE_RO	379	Wireless Pairing Mode	**Not EtherNet Enabled** Read Only value of BGM pairing mode. 0 = No active request 1 = Active request
BGM_MODULE_STATUS	380	Wireless Pairing Status	Status of the BGM (Bluetooth LE module) 0 = Idle 1 = Advertising 2 = Connected 3 = Not Responding 4 = Radio Disabled 5 = Firmware Mismatch
FIELDBUS_STATUS_A	381	Field Bus Communication Status A Register	Ethernet Module Status Register A Notifies the User of the status of the EtherNet/IP Module.
FIELDBUS_STATUS_B	382	Field Bus Communication Status B Register	Ethernet Module Status Register B Notifies the User of the status of the EtherNet/IP Module.
ETH_IP_ADDR_A	383	EtherNet/IP Address Upper 16 Bits	**Parameter Database Only**, Used to Read EtherNet/IP Address.
ETH_IP_ADDR_B	384	EtherNet/IP Address Lower 16 Bits	
ETH_SUB_NET_A	385	EtherNet/IP Subnet Upper 16 Bits	**Parameter Database Only**, Used to Read EtherNet/IP Subnet.
ETH_SUB_NET_B	386	EtherNet/IP Subnet Lower 16 Bits	

ETH_DEF_GATEWAY_A	387	EtherNet/IP Gateway Upper 16 Bits	**Parameter Database Only**, Used to Read EtherNet/IP Gateway.
ETH_DEF_GATEWAY_B	388	EtherNet/IP Gateway Lower 16 Bits	
FB_CONFIG	389	Fieldbus Configuration Status	**Parameter Database Only**, bit 0 is DCHP ON= 0 OFF=1
FB_LED	390	Fieldbus Debug LED's	**Parameter Database Only**, two bits per each of the 8 LEDs with 0b00=off, 0b01=on, 0b10=blinking, 0b11=not set
ETH_MAC_ADDR_A	391	EtherNet/IP MAC Address Upper 16 Bits	**Parameter Database Only**, Used to Read EtherNet/IP MAC Address Upper 16 bits.
ETH_MAC_ADDR_B	392	EtherNet/IP MAC Address Middle 16 Bits	
ETH_MAC_ADDR_C	393	EtherNet/IP MAC Address Lower 16 Bits	
SYS_NULL_STAT	400	Factory PCB Calibration Status	System Calibration Status (PCB Cal Status) Read-only 0 = Not Calibrated 1 = PCB Calibrated
SYS_NULL_TMR	401	Factory PCB Calibration Timer Value	System null timer - Indicates whether the unit is calibrating. In units of 10s of milliseconds (600 = 6 seconds)
SYS_INT_HB	402	System Interrupt Heartbeat Counter	Processor Internal Heartbeat Counter Counts and rolls over to zero used to verify Processor Clock Range: 0 to 65535
SYS_BG_HB	403	System Background Heartbeat Counter	Processor background heartbeat Counter Counts and rolls over to zero used to verify processor clock operation Range: 0 to 65535
SYS_MAG_CAL_STATUS	404	Unit Calibration Completed Status	Six-bit bitmask of Calibration Status of Current Channels 0b000001 = channel 1 Cal complete 0b000011 = channel 1 and 2 Cal complete 0b111111 = channel 1 to 6 Cal complete
SYS_USAGE_MIN	450	Controls Processor Minimum Cycle Time Usage, (10 = 1.0%)	

SYS_USAGE_MAX	451	Processor Max Cycle Usage, (10 = 1.0%)	
SYS_USAGE_AVG	452	Processor Avg Cycle Usage, (10 = 1.0%)	
SYS_PEEK_0	453	Diagnostic Peek Value 0	A diagnostic Feedback variable used by Production and Engineering for Testing and Field Support.
SYS_PEEK_1	454	Diagnostic Peek Value 1	
SYS_PEEK_2	455	Diagnostic Peek Value 2	
SYS_PEEK_3	456	Diagnostic Peek Value 3	
NO_LOAD_CAP_CURRENT	460	Unit rated capacitance configuration, (Farads)	Expected tune circuit current at no load in tenths of amps. Range: 0 to 65535
KVAR_EFFECTIVE	461	Effective kVAR after applying kVAR factor, (kVAR)	Effective nameplate kVAR after kVAR factor. Used for kVAR contactor control 10 = 10KVAR Range: -32768 to 32767
PF_KVAR_SLOPE	462	Slope factor applied to nameplate kVAR for kVAR contactor control.	Slope factor applied to nameplate kVAR for kVAR contactor control. Range: -32768 to 32767
PF_KVAR_INTERCEPT	463	Intercept factor applied to nameplate kVAR for kVAR contactor control, (kVAR)	Intercept factor applied to nameplate kVAR for kVAR contactor control. Range: 0 to 65535
HISTORY_LOG_STATUS	464	History Log Status Value	Indicates the Status of the History Log 0 = Initializing History Log 1 = Successfully Reading/Storing History 2 = Out of Bounds history register 3 = EEPROM is busy, Try Again Later
BGM_PASSKEY_A_EIP	480	Diagnostic Feedback Parameter 1	**Ethernet Enabled but Mapped to Modbus Instance: BGM_PASSKEY_A** Read only Value of BGM Password - High Bytes Range: 0 to 65535
BGM_PASSKEY_B_EIP	481	Diagnostic Feedback Parameter 2	**Ethernet Enabled but Mapped to Modbus Instance: BGM_PASSKEY_B** Read only Value of BGM Password - Low Bytes Range: 0 to 65535
SYS_COM_ACTIVE	484	System Communication Status, connect to EtherNet/IP Address: **DiagFb5**	System Communication Status, bit 0 = Modbus RTU active, bit 1 = Bluetooth active, bit 2 = EtherNet/IP active,

SYS_CNT_MIN_OFF_TIMER_EIP	485	Diagnostic Feedback Parameter 6	**Ethernet Enabled but Mapped to Modbus Instance: SYS_CNT_MIN_OFF_TIMER** Displays count down time for contactor re-closures. Once this timer expires contactor will change the contactor state to close. Default: 60 seconds Range: 30 to 300 seconds
PARAM_ACCESS_LEVEL_EIP	486	Diagnostic Feedback Parameter 7	**Ethernet Enabled but Mapped to Modbus Instance: PARAM_ACCESS_LEVEL_RO** Determines the Level of parameter access to read and/or change parameter inputs 0 = Base access 1 = Tech access 2 = Factory access

Setpoints Register Map

Parameter Name	I/O Register Address Offsets	Description	Default & Ranges	Notes
PARAM_USER_CMD_REQ	500	Parameter Save/Load Command	Default:1 Range:0 to 300	**Note** that defaulting the flash will clear all calibration data and require that the calibration procedure be re-run. 0 = Init State 1 = Stop Update 9 = Save Curnt. Values to Flash 21 = Set User Access 25 = Set Tech Access 30 = Set Factory Access 42 = Reboot/Reset PQconnect 100 = Clear History Log 200 = Restore Defaults to Flash 255 = Erase All Calibration Data 300 = Erase Unit Calibration Data

TRACE_GO_DONE	501	Waveform Capture Trigger Command	Default:0 Range:0 to 1	Indicates whether waveform data is being captured 0 = Capture Done 1 = Start Capture
SYS_RESET	502	Contactor Reset Command	Default:0 Range:0 to 1	Reset contactor 0 = No Command 1 = Reset Contactor Closed
PARAM_KEY_A	503	Parameter Access Key Value A	Default:0 Range:0 to 65535	Read/write parameters under Tech Access
PARAM_KEY_B	504	Parameter Access Key Value B	Default:0 Range:0 to 65535	Read/write parameters under Tech Access
CT_RATIO	505	Current Transformer CT Ratio Primary Amps Relative to Five Amp Secondary	Default:50 Range:5 to 10000	Dual Turned Circuit Current Transformer (CT) ratios Note: Only required for units with two tuned circuits XXXX:5 where XXXX is the primary turns count of the CT 1000 = 1000:5 Range 5 to 10000
CURRENT_WAVEFORM_ DATA_FORMAT	506	Waveform Data Format	Default:0 Range:0 to 1	Changes the scaling of the waveforms displayed on PQvision 0 = A / 10 1 = Per Unit (10=1.0A or per unit with base of 16384 counts)
SYS_CONTROL_MODE	510	Contactor Control Mode	Default:2 Range:0 to 6	Contactor Control Mode Allows the user to keep the contactor always off/on, auto turn on/off based on desired load percentage or kVAR, external relay input, in debug close mode. 0 = Always Open 1 = Always Closed 2= Auto load 3 = Auto kVAR 4 = External Control Input 5 = No contactor 6 = Diagnostic Always Close
SYS_AUTO_CONTACTOR_ CLOSE	511	Enable Contactor Auto to Reclose	Default:0 Range:0 to 1	Contactor auto reclose, this will attempt to reclose the contactor after it has been open through a status condition 0 = Disable 1 = Enable
RATED_CURRENT	520	Unit Rated Current	Default:2500 Range:30 to 15000	Filter rated Current. 10 = 1.0 Amps Range: 3 to 1500 Arms

RATED_VOLTAGE	521	Unit Rated Voltage	Default:4800 Range:1200 to 6900	Filter Rated Voltage 10 = 1.0 Volts Range: 120 to 690 Vrms
RATED_FREQUENCY	522	Unit Rated Utility Grid Frequency, (Hz)	Default:60 Range:50 to 60	Filter Rated Frequency
TEST_VOLTAGE	524	Unit Test Voltage, (10 = 1.0 Volts)	Default:0 Range:0 to 6900	Factory Used Parameter. Used to check if Filter was configured with the correct test Voltage and frequency.
TEST_FREQUENCY	525	Unit test Frequency, (Hz)	Default:0 Range:0 to 60	
STATUS_FILTER_A_ENABLE	530	Filter Status Detection Enable A Bit Mask	Default:65535 Range:0 to 65535	**Not EtherNet Enabled**
STATUS_FILTER_B_ENABLE	531	Filter Status Detection Enable B Bit Mask	Default:65535 Range:0 to 65535	
STATUS_LINE_ENABLE	532	Line Status Detection Enable Bit Mask	Default:65535 Range:0 to 65535	
STATUS_FILTER_LOAD_ ENABLE	533	Filter Load Status Detection Enable Bit Mask	Default:65535 Range:0 to 65535	**Not EtherNet Enabled** Reference Filter Status Table in IOM To enabled desired status detections, enter bit mask from table by converting to decimal **Range: 0 to 65535**
STATUS_FILTER_A_RELAY_ ACTION	540	Filter Status A Relay Action Enable Bit Mask	Default:9 Range:0 to 65535	Reference Filter Status Table in IOM To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the relay will be activated. 0 = Disabled 65535 = All enabled
STATUS_FILTER_B_RELAY_ ACTION	541	Filter Status B Relay Action Enable Bit Mask	Default:49151 Range:0 to 65535	
STATUS_LINE_RELAY_ ACTION	542	Line Status Relay Action Enable Bit mask	Default:71 Range:0 to 65535	Reference Filter Status Table in IOM To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the relay will be activated. 0 = Disabled 65535 = All enabled
STATUS_FILTER_LOAD_ RELAY_ACTION	543	Filter Load Status Relay Action Enable Bit Mask	Default:63 Range:0 to 65535	To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the relay will be activated. Reference load status detection bits table 0 = Disabled 65535 = All Enabled

STATUS_FILTER_A_ CNT_ACTION	550	Filter Status A Tune Contactor Action Enable Bit Mask	Default:1 Range:0 to 65535	Reference Filter Status Table in IOM To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the contactor will be activated. 0 = Disabled 65535 = All enabled
STATUS_FILTER_B_ CNT_ACTION	551	Filter Status B Tune Contactor Action Enable Bit Mask	Default:36863 Range:0 to 65535	
STATUS_LINE_CNT_ACTION	552	Line Status Tune Contactor Action Enable Bit Mask	Default:64 Range:0 to 65535	Reference Filter Status Table in IOM To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the contactor will be activated. 0 = Disabled 65535 = All enabled
STATUS_FILTER_LOAD_ CNT_ ACTION	553	Filter Load Status Tune Contactor Action Enable Bit Mask	Default:0 Range:0 to 65535	Reference Filter Status Table in IOM To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the contactor will be activated. 0 = Disabled 65535 = All enabled
CNT_CLOSE_LOAD_ THRESHOLD	570	Contactor Close Threshold in Load Control Mode, (% rated current)	Default:30 Range:10 to 100	Contactor close threshold in percent rated current*
CNT_CLOSE_LOAD_ HYSTERESIS	571	Contactor Close/Open Hysteresis in Load Control Mode, (percent rated current)	Default:5 Range:2 to 50	Contactor will open when it reaches the hysteresis *
CNT_CLOSE_KVAR_ THRESHOLD	572	Contactor Close Threshold for kVAR Control Mode, (kVAR)	Default:0 Range: -1000 to 1000	Contactor close threshold for kVAR control negative setpoint = lagging target positive setpoint = leading target
CNT_CLOSE_KVAR_ HYSTERESIS	573	Contactor Close/Open Hysteresis in kVAR Control Mode, (%)	Default:10 Range:5 to 100	Contactor will open when it reaches the hysteresis
CNT_CLOSE_DELAY	574	Contactor Close Delay Time, (sec)	Default:5 Range:1 to 3600	

CNT_OPEN_DELAY	575	Contactor Open Delay Time, (sec)	Default:5 Range:1 to 3600	
SYS_PF_STEP_1_KVAR	576	Tune Circuit 1, (kVAR)	Default:5 Range:0 to 500	Desired filter kVAR for contactor to enable
SYS_PF_STEP_2_KVAR	577	Tune Circuit 2, (kVAR)	Default:5 Range:0 to 500	Filter Second Tuned Circuit kVAR (Only used for filters with dual tuned circuits)
CNT_AUTO_RECLOSE_DELAY	580	Contactor Auto Re-Close Delay Time, (sec)	Default:10 Range:120 to 65535	
CNT_POWER_ON_DELAY	581	System Power On Start Delay Time, (sec)	Default:1 Range:0 to 65535	
CNT_AUTO_RECLOSE_ ATTEMPTS	582	Contactor Auto Re-close Max Number Attempts Allowed	Default:5 Range:1 to 15	Maximum number of contactors auto re-close attempts allowed
CNT_AUTO_RECLOSE_ TIMESPAN	583	Contactor Auto Re-close Max Attempt Timespan, (sec)	Default:600 Range:300 to 65535	Maximum number of contactors auto re-close attempts time span
MB_SLAVE_ADDRESS	600	Modbus Device Slave address	Default:10 Range:1 to 247	Modbus Slave Address Range: 1 to 247
MB_BAUD_RATE	601	Modbus Device Baud Rate, (Bits per second)	Default:11520 Range:0 to 11520	Modbus Baud Rate 11520 = 115200 baud rate 960 = 9600 baud rate 3840 = 38400 baud rate
MB_PARITY	602	Modbus Device Parity	Default:2 Range:0 to 2	0 = None 1 = Odd 2 = Even
MB_SAVE_SET_FLAG	603	Mobutu Save New Settings	Default:0 Range:0 to 2	Modbus Flag Save Settings 0 = Not Saving Settings 1 = Saving Settings
BOOTLOADER_START	604	Bootloader Command	Default:0 Range:0 to 2	Used to navigate to bootloader, which launches the main program 0 = No Action 1 = Start Bootloader 2 = Start Recovery

RELAY_INPUT_1_CONFIG	610	Relay Input 1 Configuration	Default:0 Range:0 to 4	Customer External Control Input 1: J7 of the PCB 0 = Disabled 1 = Tuning Reactor Thermal Switch Input 2 = Line Reactor Thermal Switch Input 3 = Reset Command 4 = External Control Input
RELAY_INPUT_2_CONFIG	611	Relay input 2 configuration	Default:0 Range:0 to 4	Customer External Control Input 2: J8 of the PCB 0 = Disabled 1 = Tuning Reactor Thermal Switch Input 2 = Line Reactor Thermal Switch Input 3 = Reset Command 4 = External Control Input
V_LINE_OV_ONSET	620	Overvoltage Onset Threshold	Default:130 Range:100 to 150	percent rated voltage
V_LINE_OV_CLEAR	621	Overvoltage Clear Threshold	Default:125 Range:90 to 140	
V_LINE_OV_DELAY	622	Overvoltage Delay Time	Default:2 Range:1 to 3600	seconds
V_LINE_UV_ONSET	623	Undervoltage Phase Loss Onset Threshold	Default:75 Range:50 to 90	percent rated voltage
V_LINE_UV_CLEAR	624	Undervoltage Phase Loss Clear Threshold	Default:80 Range:60 to 100	
V_LINE_UV_DELAY	625	Undervoltage Phase Loss Delay Time	Default:1 Range:1 to 3600	seconds
I_LINE_OC_ONSET	626	Overcurrent Onset Threshold	Default:150 Range:100 to 200	percent rated current
I_LINE_OC_CLEAR	627	Overcurrent Clear Threshold	Default:140 Range:90 to 190	
I_LINE_OC_DELAY	628	Overcurrent Delay Time	Default:5 Range:1 to 3600	seconds
I_LOAD_BALANCE_ONSET	640	Load Current Balance Onset Threshold	Default:75 Range:10 to 90	percent rated current
I_LOAD_BALANCE_CLEAR	641	Load Current Balance Clear Threshold	Default:80 Range:10 to 90	
I_LOAD_BALANCE_DELAY	642	Load Current Balance Delay Time	Default:4 Range:1 to 3600	seconds

I_LOAD_BALANCE_MIN_CURRENT	643	Load Current Balance Minimum Detect Current	Default:50 Range:10 to 100	percent rated current
I_TUNE_OC_ONSET	660	Tune Overcurrent Onset Threshold	Default:150 Range:100 to 200	
I_TUNE_OC_CLEAR	661	Tune Overcurrent Clear Threshold	Default:140 Range:90 to 190	
I_TUNE_OC_DELAY	662	Tune Overcurrent Delay Time	Default:4 Range:1 to 3600	seconds
I_TUNE_UC_ONSET	663	Tune Circuit Fundamental Undercurrent Onset Threshold	Default:65 Range:10 to 100	percent rated current
I_TUNE_UC_CLEAR	664	Tune Circuit Fundamental Undercurrent Clear Threshold	Default:70 Range:15 to 100	
I_TUNE_UC_DELAY	665	Tune Circuit Fundamental Undercurrent Delay Time	Default:3 Range:1 to 3600	seconds
I_TUNE_BALANCE_ONSET	666	Tune Circuit Current Balance Onset Threshold	Default:75 Range:10 to 90	percent rated current
I_TUNE_BALANCE_CLEAR	667	Tune Circuit Current Balance Clear Threshold	Default:80 Range:10 to 90	
I_TUNE_BALANCE_DELAY	668	Tune Circuit Current Balance Delay Time	Default:2 Range:1 to 3600	seconds
T_AMBIENT_OT_ONSET	680	Controls Overtemperature Onset Threshold	Default:700 Range:100 to 850	10 = 1.0 deg C
T_AMBIENT_OT_CLEAR	681	Controls Overtemperature Clear Threshold	Default:600 Range:50 to 800	
T_AMBIENT_OT_DELAY	682	Controls Overtemperature Delay Time	Default:5 Range:1 to 3600	seconds
FAULT_HIGH_THD_ONSET	690	Voltage THD High Onset Threshold	Default:80 Range:20 to 200	percent rated voltage

FAULT_HIGH_THD_CLEAR	691	Voltage THD High Clear Threshold	Default:110 Range:20 to 200	
FAULT_HIGH_THD_DELAY	692	Voltage THD High Delay Time	Default:3 Range:1 to 3600	seconds
FAULT_PHASE_ROTATION	693	Phase Rotation Status Setpoint	Default:1 Range:0 to 2	Filter expected input phase orientation 0 = Undef 1 = Forward 2 = Reverse
SYS_MAG_CAL_ENABLE	700	System Magnitude Calibration	Default:0 Range:0 to 1	System Magnitude Calibration 0 = Disable 1 = Enable
SYS_I_LINE_CAL_A	710	Reference Calibration Current Line Phase A	Default:0 Range:0 to 65535	Input current measured on A phase of the filter 10 = 1.0A
SYS_I_LINE_CAL_B	711	Reference Calibration Current Line Phase B	Default:0 Range:0 to 65535	Input current measured on B phase of the filter 10 = 1.0A
SYS_I_LINE_CAL_C	712	Reference Calibration Current Line Phase C	Default:0 Range:0 to 65535	Input current measured on C phase of the filter 10 = 1.0A
SYS_I_TUNE_CAL_A	713	Reference Calibration current tune phase A	Default:0 Range:0 to 65535	Tune circuit current measured on A phase of the filter. 10 = 1.0A
SYS_I_TUNE_CAL_B	714	Reference Calibration current tune phase B	Default:0 Range:0 to 65535	Tune circuit current measured on B phase of the filter. 10 = 1.0A
SYS_I_TUNE_CAL_C	715	Reference Calibration current tune phase C	Default:0 Range:0 to 65535	Tune circuit current measured on C phase of the filter. 10 = 1.0A
SYS_MAG_CAL_TOL	716	Current Calculation magnitude calibration tolerance	Default:5 Range:0 to 15000	System Mag calibration Tolerance Value used by the PQconnect for setting the threshold for Calibrated reference currents Pass/Fail range. 20 = 0.02 amps tolerance.
I_LINE_EST_A_SCALAR	720	Magnitude Scalar for current calculation line phase A	Default:6000 Range: -32768 to 32767	**Value set by Factory**, Unit Calibration Scalars that are stored after a successfully Unit Calibration. **DO NOT MODIFY**
I_LINE_EST_B_SCALAR	721	Magnitude Scalar for current calculation line phase B	Default:6000 Range: -32768 to 32767	
I_LINE_EST_C_SCALAR	722	Magnitude Scalar for current calculation line phase C	Default:6000 Range: -32768 to 32767	

I_TUNE_EST_A_SCALAR	723	Magnitude Scalar for current calculation tune phase A	Default:4000 Range: -32768 to 32767	**Value set by Factory**, Unit Calibration Scalars that are stored after a successfully Unit Calibration. **DO NOT MODIFY**
I_TUNE_EST_B_SCALAR	724	Magnitude Scalar for current calculation tune phase B	Default:4000 Range: -32768 to 32767	
I_TUNE_EST_C_SCALAR	725	Magnitude Scalar for current calculation tune phase C	Default:4000 Range: -32768 to 32767	
V_LINE_SCALAR_A	730	Magnitude Scalar for line voltage phase AB	Default:5982 Range: -32768 to 32767	Value set by Factory. **DO NOT MODIFY**
V_LINE_SCALAR_B	731	Magnitude scalar for line voltage phase BC	Default:5982 Range: -32768 to 32767	
V_LINE_SCALAR_C	732	Magnitude scalar for line voltage phase CA	Default:5982 Range: -32768 to 32767	
V_LOAD_SCALAR_A	733	Magnitude Scalar for load voltage phase AB	Default:5982 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
V_LOAD_SCALAR_C	734	Magnitude Scalar for load voltage phase CA	Default:5982 Range: -32768 to 32767	
V_TUNE_SCALAR_A	735	Magnitude Scalar for tune voltage phase AB	Default:5982 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
V_TUNE_SCALAR_C	736	Magnitude Scalar for tune voltage phase CA	Default:5982 Range: -32768 to 32767	
I_LINE_SCALAR_A	737	Magnitude Scalar for line current CT phase A	Default:1091 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
I_LINE_SCALAR_C	738	Magnitude Scalar for line current CT phase C	Default:1091 Range: -32768 to 32767	
I_TUNE_SCALAR_A	739	Magnitude Scalar for tune current CT phase A	Default:1091 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
I_TUNE_SCALAR_C	740	Magnitude Scalar for tune current CT phase A	Default:1091 Range: -32768 to 32767	
T_AMBIENT_SCALAR	741	Magnitude Scalar for controls temperature	Default:12000 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
V_LINE_RMS_SCALAR	750	RMS Calculation scalar for line voltage	Default:437 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
V_LOAD_RMS_SCALAR	751	RMS Calculation scalar for load voltage	Default:437 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
I_LINE_RMS_SCALAR	752	RMS Calculation scalar for line current	Default:128 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**

I_LOAD_RMS_SCALAR	753	RMS Calculation scalar for load current	Default:128 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
SYS_CNT_MIN_OFF_TIME	800	Contactor Minimum open time	Default:10 Range:10 to 300	Seconds
I_TUNE_TAP_GAIN	801	Line Reactor Tap Turn coupling gain	Default:1820 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY** A zero value indicates that the Filter is configured for High THVD, and the tuning reactor is tapped to the Finish of the Filter's line reactor.
V_THD_SCALAR	802	Voltage THD Gain adjustment factor	Default:16384 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
I_THD_SCALAR	803	Current THD Gain adjustment factor	Default:16384 Range: -32768 to 32767	
V_THD_OFFSET	804	Voltage THD Offset adjustment factor	Default:0 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
I_THD_OFFSET	805	Current THD Offset adjustment factor	Default:0 Range: -32768 to 32767	
SYS_NULL_EN	820	Factory PCB calibration enable	Default:0 Range:0 to 1	PCB Calibration 0 = Disable 1 = Enable
V_LINE_A_OFFSET	830	Line Voltage Offset Phase A	Default:2048 Range:0 to 4096	Value set by Factory **DO NOT MODIFY**
V_LINE_B_OFFSET	831	Line Voltage Offset Phase B	Default:2048 Range:0 to 4096	
V_LINE_C_OFFSET	832	Line Voltage Offset Phase C	Default:2048 Range:0 to 4096	
V_LOAD_A_OFFSET	833	Load Voltage Offset Phase A	Default:2048 Range:0 to 4096	Value set by Factory **DO NOT MODIFY**
V_LOAD_C_OFFSET	834	Load Voltage Offset Phase C	Default:2048 Range:0 to 4096	
V_TUNE_A_OFFSET	835	Tune Voltage Offset Phase A	Default:2048 Range:0 to 4096	Value set by Factory **DO NOT MODIFY**
V_TUNE_C_OFFSET	836	Tune Voltage Offset Phase C	Default:2048 Range:0 to 4096	
V_DIFF_LINE_A_OFFSET	837	Reactor Diff Voltage Offset Phase A	Default:2048 Range:0 to 4096	Value set by Factory **DO NOT MODIFY**
V_DIFF_LINE_B_OFFSET	838	Reactor Diff Voltage Offset Phase B	Default:2048 Range:0 to 4096	
V_DIFF_LINE_C_OFFSET	839	Reactor Diff Voltage Offset Phase C	Default:2048 Range:0 to 4096	
V_DIFF_TUNE_A_OFFSET	840	Reactor Diff Voltage Offset Phase A	Default:2048 Range:0 to 4096	Value set by Factory **DO NOT MODIFY**
V_DIFF_TUNE_B_OFFSET	841	Reactor Diff Voltage Offset Phase B	Default:2048 Range:0 to 4096	
V_DIFF_TUNE_C_OFFSET	842	Reactor Diff Voltage Offset Phase C	Default:2048 Range:0 to 4096	

I_LINE_A_OFFSET	843	Line Current Offset Phase A for CT Input	Default:2048 Range:0 to 8192	Value set by Factory **DO NOT MODIFY**
I_LINE_C_OFFSET	844	Line Current Offset Phase A for CT Input	Default:2048 Range:0 to 8192	
I_LOAD_A_OFFSET	845	Load Current Offset Phase A for CT input	Default:2048 Range:0 to 8192	Value set by Factory **DO NOT MODIFY**
I_LOAD_C_OFFSET	846	Load Current Offset Phase A for CT input	Default:2048 Range:0 to 8192	
T_AMBIENT_OFFSET	847	Offset for Controls Temperature	Default:683 Range: -8192 to 8192	Value set by Factory **DO NOT MODIFY**
V_DIFF_LINE_A_SCALAR	850	Line Reactor Voltage Scalar Phase A	Default:16384 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
V_DIFF_LINE_B_SCALAR	851	Line Reactor Voltage Scalar Phase B	Default:16384 Range: -32768 to 32767	
V_DIFF_LINE_C_SCALAR	852	Line Reactor Voltage Scalar Phase C	Default:16384 Range: -32768 to 32767	
V_DIFF_TUNE_A_SCALAR	853	Tune Reactor Voltage Scalar Phase A	Default:16384 Range: -32768 to 32767	Value set by Factory **DO NOT MODIFY**
V_DIFF_TUNE_B_SCALAR	854	Tune Reactor Voltage Scalar Phase B	Default:16384 Range: -32768 to 32767	
V_DIFF_TUNE_C_SCALAR	855	Tune Reactor Voltage Scalar Phase C	Default:16384 Range: -32768 to 32767	
I_LINE_EST_A_INT_DECAY	860	Line Current Estimation Decay Phase A	Default:16375 Range:0 to 65535	Value set by Factory **DO NOT MODIFY**
I_LINE_EST_B_INT_DECAY	861	Line Current Estimation Decay Phase B	Default:16375 Range:0 to 65535	
I_LINE_EST_C_INT_DECAY	862	Line Current Estimation Decay Phase C	Default:16375 Range:0 to 65535	
I_TUNE_EST_A_INT_DECAY	863	Tune Current Estimation Decay Phase A	Default:16375 Range:0 to 65535	Value set by Factory **DO NOT MODIFY**
I_TUNE_EST_B_INT_DECAY	864	Tune Current Estimation Decay Phase B	Default:16375 Range:0 to 65535	
I_TUNE_EST_C_INT_DECAY	865	Tune Current Estimation Decay Phase C	Default:16375 Range:0 to 65535	
I_LINE_EST_A_SIN_NULL	870	Line Current Estimation Calibration Sine Phase A	Default:0 Range: -32768 to 32767	Value set by Factory
I_LINE_EST_A_COS_NULL	871	Line Current Estimation Calibration Cosine Phase A	Default:0 Range: -32768 to 32767	**Not EtherNet Enabled** **DO NOT MODIFY** Value set by Factory.

I_LINE_EST_B_SIN_NULL	872	Line Current Estimation Calibration Sine Phase B	Default:0 Range: -32768 to 32767	Value set by Factory
I_LINE_EST_B_COS_NULL	873	Line Current Estimation Calibration Cosine Phase B	Default:0 Range: -32768 to 32767	**Not EtherNet Enabled** **DO NOT MODIFY** Value set by Factory.
I_LINE_EST_C_SIN_NULL	874	Line Current Estimation Calibration Sine Phase C	Default:0 Range: -32768 to 32767	Value set by Factory
I_LINE_EST_C_COS_NULL	875	Line Current Estimation Calibration Cosine Phase C	Default:0 Range: -32768 to 32767	**Not EtherNet Enabled** **DO NOT MODIFY** Value set by Factory.
I_TUNE_EST_A_SIN_NULL	876	Tune Current Estimation Calibration Sine Phase A	Default:0 Range:-32768 to 32767	Value set by Factory
I_TUNE_EST_A_COS_NULL	877	Tune Current Estimation Calibration Cosine Phase A	Default:0 Range:-32768 to 32767	**Not EtherNet Enabled** **DO NOT MODIFY** Value set by Factory.
I_TUNE_EST_B_SIN_NULL	878	Tune Current Estimation Calibration Sine Phase B	Default:0 Range: -32768 to 32767	Value set by Factory
I_TUNE_EST_B_COS_NULL	879	Tune Current Estimation Calibration Cosine Phase B	Default:0 Range: -32768 to 32767	**Not EtherNet Enabled** **DO NOT MODIFY** Value set by Factory
I_TUNE_EST_C_SIN_NULL	880	Tune Current Estimation Calibration Sine Phase C	Default:0 Range: -32768 to 32767	Value set by Factory
I_TUNE_EST_C_COS_NULL	881	Tune Current Estimation Calibration Cosine Phase C	Default:0 Range: -32768 to 32767	**Not EtherNet Enabled** **DO NOT MODIFY** Value set by Factory
BLUETOOTH_ENABLE	900	Bluetooth Radio Enable	Default:1 Range:0 to 1	Set to Enable BGM 1 = Enabled 0 = Disabled
SYS_CPU_THRESHOLD	901	Controls Processor Fault Threshold	Default:12369 Range:0 to 17361	
DSP_MODEL_NUM	902	Digital Signal Processor DSP Model Number	Default: N/A Range:0 to 65535	**Not EtherNet Enabled** Filter Model Number 0 = Undef 3 = Sim 101 = HSD 102 = HGL 103 = HGP 104 = HSL 105 = HSE 200 = KIT - BLANK 202 = KIT - HGL 203 = KIT - HGP 205 = KIT - HSE

SYS_SERIAL_NUM_2	903	Upper 16 bits of job number of the unit serial number	Default:0 Range:0 to 65535	Unit serial number section upper 16 bits of 32-bit unit job number Parameter contains UUU in the UUULLLL-NN serial number format.
SYS_SERIAL_NUM_1	904	Lower 16 bits of job number of the unit serial number	Default:0 Range:0 to 65535	Unit serial number section lower 16 bits of 32-bit unit job number Parameter contains LLLL in the UUULLLL-NN serial number format.
SYS_SERIAL_NUM_0	905	Line Number of the unit serial number	Default:0 Range:0 to 65535	Unit serial number section wo-digit unit number Parameter contains NN in the UUULLLL- NN serial number format.
PCB_SERIAL_NUM_1	906	Upper 16 bits of the PCB serial number	Default:0 Range:0 to 65535	PCB serial number section Upper 16 bits of 32-bit unit job number Parameter contains UUUU in the UUUULLLL-NNN serial number format.
PCB_SERIAL_NUM_0	907	Lower 16 bits of the PCB serial number	Default:0 Range:0 to 65535	PCB serial number section Lower 16 bits of 32-bit unit job number Parameter contains LLLL in the UUUULLLL-NNN serial number format.
PCB_TEST_NUM	908	Test Number of the PCB serial number	Default:0 Range:0 to 65535	PCB serial number section three-digit unit number Parameter contains NNN in the UUUULLLL- NNN serial number format.
SYS_POKE_0	950	Diagnostic Poke Variable 0	Default:0 Range: -32768 to 32767	
SYS_POKE_1	951	Diagnostic Poke Variable 1	Default:0 Range: -32768 to 32767	
SYS_POKE_2	952	Diagnostic Poke Variable 2	Default:0 Range: -32768 to 32767	
SYS_POKE_3	953	Diagnostic Poke Variable 3	Default:0 Range: -32768 to 32767	

SYS_PEEK_ADDR_0	954	Diagnostic Peek Address 0	Default:0 Range:0 to 65535	
SYS_PEEK_ADDR_1	955	Diagnostic Peek Address 1	Default:0 Range:0 to 65535	
SYS_PEEK_ADDR_2	956	Diagnostic Peek Address 2	Default:0 Range:0 to 65535	
SYS_PEEK_ADDR_3	957	Diagnostic Peek Address 3	Default:0 Range:0 to 65535	
BGM_STATIC_PASSKEY_A	970	Upper 16 bits of Wireless Password	Default:1 Range:0 to 15	
BGM_STATIC_PASSKEY_B	971	Lower 16 bits of Wireless Password	Default:45575 Range:0 to 65535	
BGM_SECUIRTY_LEVEL	972	Wireless Security Level	Default:0 Range:0 to 1	BGM Security level. High Security mode blocks new pairing requests. Passkey changes each time a connection is attempted. 0 = Low Security 1 = High Security
BGM_NUMERIC_ID	973	Wireless Numeric Identifier	Default:0 Range:0 to 99	User Written Value of BGM Numeric ID
BGM_PAIRING_MODE	974	Wireless Pairing Mode Request	Default:0 Range:0 to 1	0 = No active request 1 = Active request
BGM_COMMAND	975	Wireless Command Input	Default:0 Range:0 to 255	
FIELD_BUS_COMMAND	976	Field Bus Communication Module Command Input	Default:0 Range:0 to 255	Field Bus Command Input 0 = No Command 3 = Reset 5 = Shutdown
RATED_STEP_1_CAP	980	Unit Rated Capacitance for Tune Step 1	Default:575 Range:0 to 20000	Filter rated (step 1) capacitance Used for tune circuit no load current. 10 = 0.1 uFarad
RATED_STEP_2_CAP	981	Unit Rated Capacitance for Tune Step 2	Default:0 Range:0 to 20000	Filter rated (step 2) capacitance Used for tune circuit no load current. 10 = 0.1 uFarad (Only for filters with dual tuned circuits)
RATED_CAP_CONFIG	982	Unit Rated Capacitance Configuration	Default:0 Range:0 to 1	Filter rated capacitance configuration Used for tune circuit no load current 0 = Delta 1 = Wye

CT_ENABLE	983	Current Transformer CT Feedback Enable	Default:0 Range:0 to 1	Only used for filters with dual tuned circuits 0 = Disabled 1 = Enabled
PF_KVAR_FACTOR_NL	984	Factor Applied to Nameplate kVAR at No Load for kVAR Contactor Control	Default:105 Range:100 to 140	100 = 1.0
PF_KVAR_FACTOR_FL	985	Factor Applied to Nameplate kVAR at Full Load for kVAR Contactor Control	Default:115 Range:100 to 140	100 = 1.0
CONFIG_MODE	986	Feedback Sensing Configuration Mode Selection	Default:1 Range:1 to 3	
CNT_CLOSE_COUNT	987	Count of Times Contactor has Closed	Default:0 Range:0 to 65535	
POWER_CYC_COUNT	988	Running Number of Powers On-Off cycles	Default:0 Range:0 to 255	
HISTORY_LOG_REQUEST	989	Status Detection History Record Request Command	Default:0 Range:0 to 0	
PROC_DATA_CMD_EN	1007	Enables and Disables Implicit Setpoint Writes	Default: 0 Range: 0 to 1	Only used for Passive Filters with EtherNet/IP Connectivity 0 = Implicit IO Writes Disabled 1 = Implicit IO Writes Enabled

Filter Status Register References

Table 34: Filter Status References

16-bit values	
Register B	
Bit	**Status Detection**
0	TUNE_PHASE_LOSS_A
1	TUNE_PHASE_LOSS_B
2	TUNE_PHASE_LOSS_C
3	TUNE_BALANCE_LOSS_A
4	TUNE_BALANCE_LOSS_B
5	TUNE_BALANCE_LOSS_C
6	TUNE_UNDERCURRENT_A
7	TUNE_UNDERCURRENT_B
8	TUNE_UNDERCURRENT_C
9	TUNE_OVERCURRENT_A
10	TUNE_OVERCURRENT_B
11	TUNE_OVERCURRENT_C
12	UNDER_TEMP
13	OVER_TEMP
14	CPU_ERROR
15	TUNE_REACTOR_THERMAL_SW
Register A	
0	RECLOSE_LIMIT
1	NCP_FAULT_A
2	NCP_FAULT_B
3	LINE_REACTOR_THERMAL_SW

Table 35: Filter Line Status References

16-bit values	
Bit	**Status Detection**
0	PHASE_LOSS_A
1	PHASE_LOSS_B
2	PHASE_LOSS_C
3	OVERVOLTAGE_A
4	OVERVOLTAGE_B
5	OVERVOLTAGE_C
6	FILTER_FREQ_MISMATCH
7	HIGH_VOLTAGE_THD
8	LINE_PHASE_ROTATION

Table 36: Filter Load Status References

16-bit values	
Bit	**Status Detection**
0	BALANCE_A
1	BALANCE_B
2	BALANCE_C
3	OVERCURRENT_A
4	OVERCURRENT_B
5	OVERCURRENT_C

Waveform Data

The waveform data displayed by the PQconnect is available in the Modbus read analog input register data space. Use function code 4 for reading inputs.

Table 37: Waveform Data

Waveform	Address	Length
Filter Line Voltage Phase A	0	192
Filter Line Voltage Phase B	192	192
Filter Line Voltage Phase C	384	192
Filter Line Current Phase A	576	192
Filter Line Current Phase B	768	192
Filter Line Current Phase C	960	192
Filter Load Voltage Phase A	1152	192
Filter Load Voltage Phase B	1344	192
Filter Load Voltage Phase C	1536	192
Filter Load Current Phase A	1728	192
Filter Load Current Phase B	1920	192
Filter Load Current Phase C	2112	192
Filter Line Voltage Phase A Spectrum	2304	50
Filter Line Voltage Phase B Spectrum	2354	50
Filter Line Voltage Phase C Spectrum	2404	50
Filter Line Current Phase A Spectrum	2454	50
Filter Line Current Phase B Spectrum	2504	50
Filter Line Current Phase C Spectrum	2554	50
Filter Load Voltage Phase A Spectrum	2604	50
Filter Load Voltage Phase B Spectrum	2654	50
Filter Load Voltage Phase C Spectrum	2704	50
Filter Load Current Phase A Spectrum	2754	50
Filter Load Current Phase B Spectrum	2804	50
Filter Load Current Phase C Spectrum	2854	50
Debug Waveform Trace Channel A	4505	192
Debug Waveform Trace Channel B	4697	192
Debug Waveform Trace Channel C	4889	192

Status Detection History Data

The Status Detection History data displayed by the PQconnect board is available in the Modbus Analog Read Input Register Data space (Function Code of 4) at the following addresses:

Table 38 : History Records Modbus Location

History Log Record	History Record Start Address	Length
History Record 0	2904	16
History Record 1	2920	16
History Record 2	2936	16
…	…	…
History Record 99	4504	16

The history record is a circular buffer of 100 records from index 0 to 99. When the history buffer filles up the oldest record is overwritten. The newest entry in the history record is at index 0 and the oldest entry is at index 99. The history records can be fully cleared at any time of the collection processes.

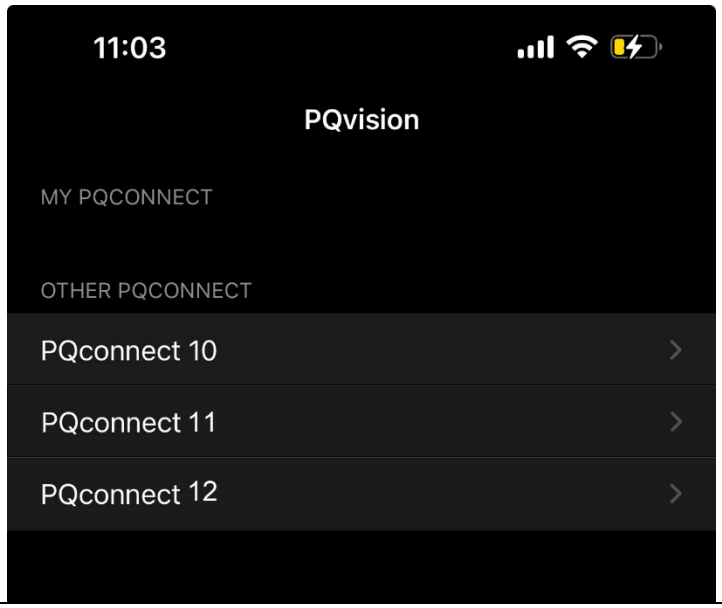
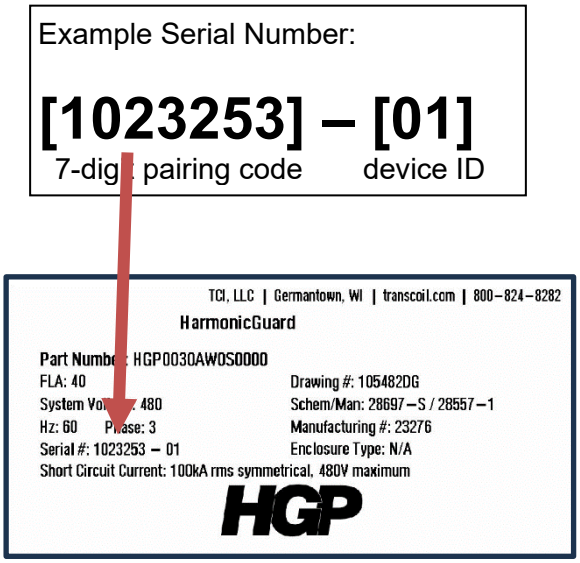
A history record is logged each time parameter ***HISTORY_LOG_STATUS*** changes. Each history record is a collection of 16 bytes with the following format. An easy to view and read History Log is offered in PQvision Desktop, for more information please read ***PQvision PC Application Screen Elements – Status Detection History Log***.

Table 39: History Fields

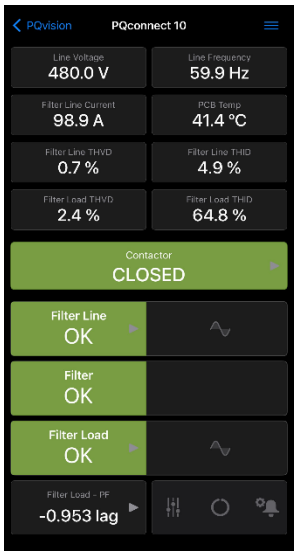
Bytes	Value	Format
0 1 2 3	Timestamp Seconds (4 bytes)	Seconds value of timestamp. Timestamp seconds: milliseconds value is the time since power on of the event.
4	Timestamp Power Cycle Count	Range 0 to 255. Indicates the number of times the PQconnect board has been reset/power cycled.
5	Timestamp Milliseconds	Milliseconds value of timestamp. Shown in units of 10s of milliseconds.
6 7	Filter Status A	Filter Status Detection that are active in Register A
8 9	Filter Status B	Filter Status Detection that are active in Register B
10 11	Filter Line Status	Filter Line Status Detection register that displays current faults.
12 13	Filter Load Status	Filter Load Status Detection register that displays current faults.
14 16	16 Bit, Two's Compliment Checksum	History Record Checksum. When this 16-bit value is added together with the rest of the history records as 16-bit values the result should be zero if no data errors exist in the packet.

Bluetooth Wireless Technology

PQconnect offers Bluetooth wireless technology which is usable for PQvision App for Android & Apple devices. With the PQvision mobile app, monitoring and controlling your passive filter has never been easier. For setup instructions and tutorials on the mobile app visit: PQvision Mobile or follow the instructions below.

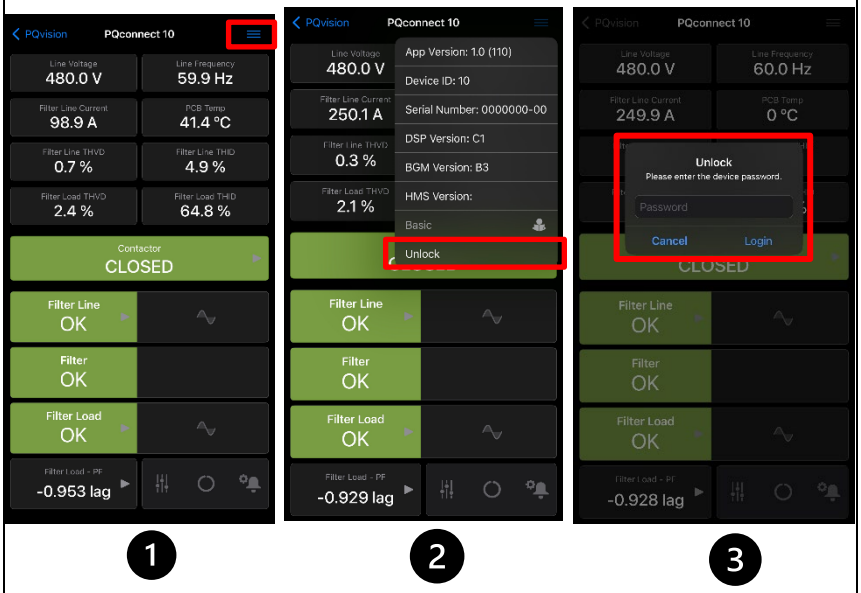
System Requirements:	**Android OS 10.0 or higher** **IOS 17.0 or higher** **Bluetooth 4.2**
Pairing Instructions	
1. Once PQvision is installed from Google Play store/App store, open the PQvision mobile app and allow PQconnect to use Bluetooth. Any Bluetooth capable PQconnect devices in range will be automatically displayed on the connection screen. 2. Select the PQconnect device by tapping on the > icon. Each PQconnect device in the app will be identified by their Device ID.	
3. A prompt to enter the Bluetooth pairing passkey will pop up automatically. Enter the last 6-digit serial number found on the product nameplate. **Do not include the Device ID number.** **Important Note:** The Serial number can be found on the product nameplate on the front of each passive filter.	

4. Once the passkey is successfully entered, all filter data will be presented.



Changing Settings

1. Once connected to a PQconnect device, select on the menu icon on the right-hand corner of the app
2. Top the unlock button to unlock parameter access.
3. If prompted, enter the tech password – **08252014** – to unlock parameter access.



Troubleshooting

1. Ensure Bluetooth is enabled on the Android device.
2. If no PQconnect devices are displayed on the connect screen:
   - Move closer to the unit to ensure the device is in range.
   - Verify that the PQconnect is powered on and that the CPU LED is blinking.
   - Restart the app.
3. If the pairing prompt does not appear automatically:
   - Wait up to 15 seconds for the prompt to appear.
   - Close the app completely and reopen it.

For Additional Troubleshooting tips please visit TCI: [PQvision Mobile.]

EtherNet/IP

The PQconnect EtherNet/IP network communication interface transmits and receives command and status data from the PQconnect Modbus master over an ethernet link. EtherNet/IP was developed in the late 1990s and released in early 2000, which is one of serval network protocols that operates under the common industrial protocol (CIP), an open application layer protocol. EtherNet/IP should not be confused with Ethernet as they work in different ways.

Some benefits of EtherNet/IP include compatibility with Common protocols and transport devices using traditional EtherNet. Certified standardization by ODVA, and endless tools and training

The EtherNet/IP version of the PQconnect board is capable of Implicit I/O data communication with a PLC, HMI, SCADA, or other EtherNet/IP scanner device. TCI LLC, An Allied Motion Company is an ODVA licensed vendor (Vendor ID 1583). See our EtherNet/IP EDS File and Conformance Info on the HarmonicGuard Product page on our website for information about our Declaration of Conformity and EDS File.

The EtherNet/IP communication interface is provided on the HGP & HGL to allow the unit to be configured and data collected from the unit. The EtherNet interface is capable of dual 10/100 Mbps and uses IP Protocol. The EtherNet/IP communications interface is implemented using a third party, industry leading embedded module EtherNet/IP solution from HMS (B40 Module). See the Table below for a full feature list of the EtherNet/IP communication interface.

Table 40: EtherNet/IP communication interface

Feature	Description
Profile Support	EtherNet/IP Generic Device (keyable), Address Conflict Detection (ACD),
Connection	Dual 10/100 Mbit twisted pair RJ45 Connection
Galvanic Isolation	Transformer Isolated Ethernet Interface
TCP/IP Settings	Web Browser Based Configuration or HMS IP config utility network scan and configuration tool
Baud Rate	10/100 Mbps Auto Detect
Protocol Conformance	ODVA CONFORMANT (ODVA file number 12256.01, ODVA vendor ID 1583).

Wiring for EtherNet/IP communication

The dual PQconnect board ethernet RJ45 connectors are located at J16 on the PQconnect board. See Figure 5: PQconnect Connections as a reference. It is highly recommended to use an ethernet Cat 5/6 cable for the connection to the PQconnect board and the target device. Connect one end of an ethernet patch cable to the ethernet port on the PQconnect board, and the other end either to a switch connected to your network or device.

Note: You can also connect to the ethernet port on the PQconnect directly to a computer or laptop.

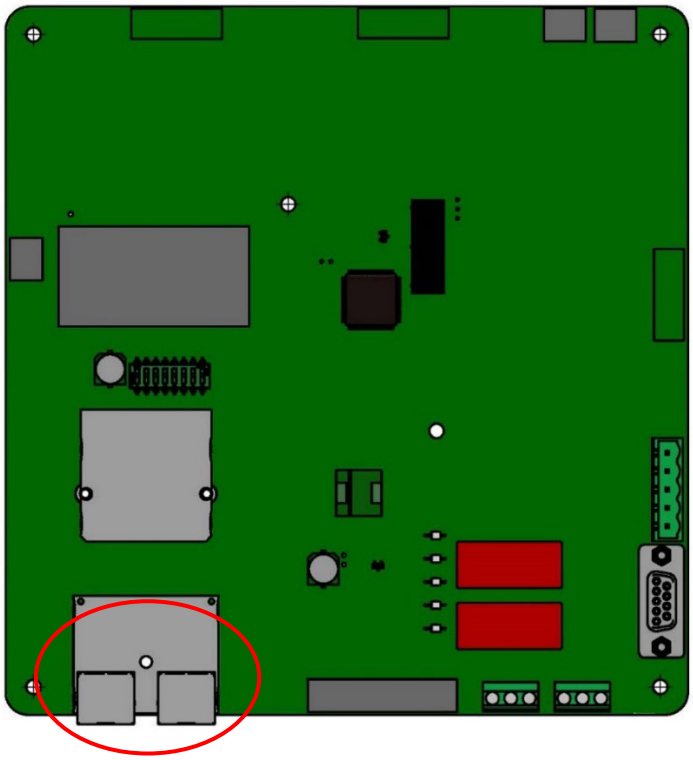
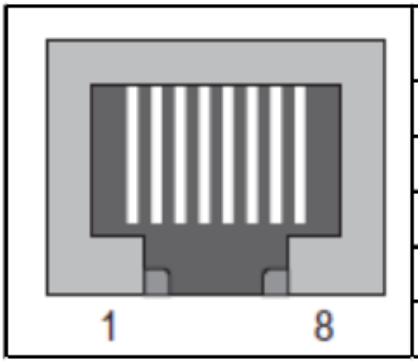


Figure 19: PQconnect Ethernet Connection Headers (Circled in Red)



Pin Number	Description
1	TD+
2	TD-
3	RD+
6	RD-
4, 5, 7, 8	Termination

Table 41: Ethernet Connection Pin Out

IP Address Configuration for EtherNet/IP communication

To use EtherNet/IP with a PLC/HMI/SCADA device, the PQconnect EtherNet/IP module with a different IP address than **192.168.1.35**. Which may be needed if the device is being connected has a different subnet mask of your network/internet. See the table below for the default settings.

Table 42: IP Address Default Settings for EtherNet/IP Communication

Setting	Default Value
IP Address	192.168.1.35
Gateway	0.0.0.0
Subnet	255.255.255.0
DHCP	Disabled

The steps below explain how to switch to a different IP address for your network. **Please note that these steps assume that the PQconnect board and unit is energized but may or may not be enabled for correcting harmonics.**

1. Connect a Cat-5 or higher ethernet cable to the EtherNet/IP module on the PQconnect board. These should be 2 ethernet ports next to each other, connected to either one. Connect this ethernet cable to your computer.
2. Open HMS IP Configuration Tool which is an IP configuration Windows tool for TCP/IP settings in HMS devices. IPconfig will detect all compatible and active HMS devices on the local network and do not have to be on the same EtherNet/IP subnet as the computer is running IPconfig.
    a. When IPconfig is started it will automatically scan for any compatible and active HMS devices. Click on the one Flag Icon of the application to blink the EtherNet/IP Module LEDs lights.

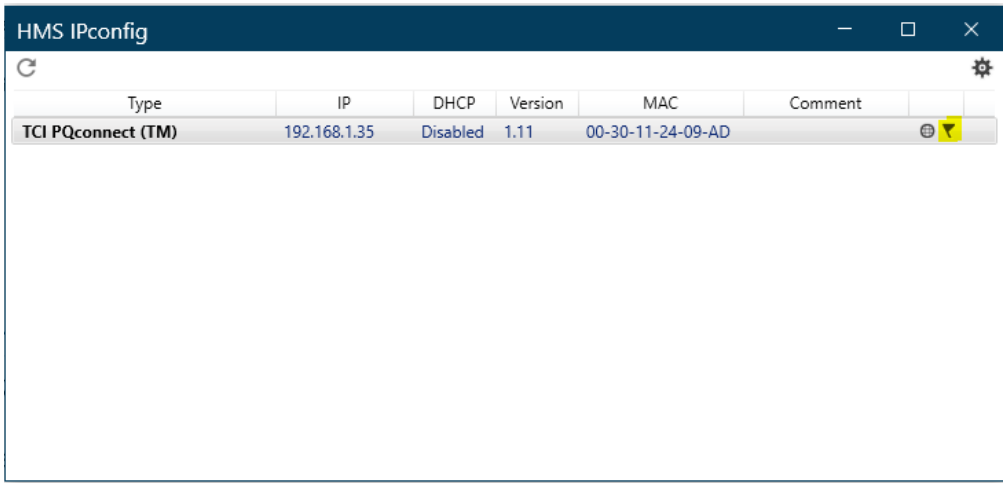


Figure 20: Flag Icon Highlight

    b. To change the IP configuration for a device, click on the device in the list. A device configuration subpage should appear to allow you to edit your IP and DNS configuration. **After editing the configuration, click on apply the new setting and reboot the device.**

3. It is also possible to set the IP address and configure other networks in the EtherNet/IP module using its bult in web server via an internet browser window.

    a. First the IP address of the PQconnect board and type the IP address into the browser search bar. A window like the following picture will open.

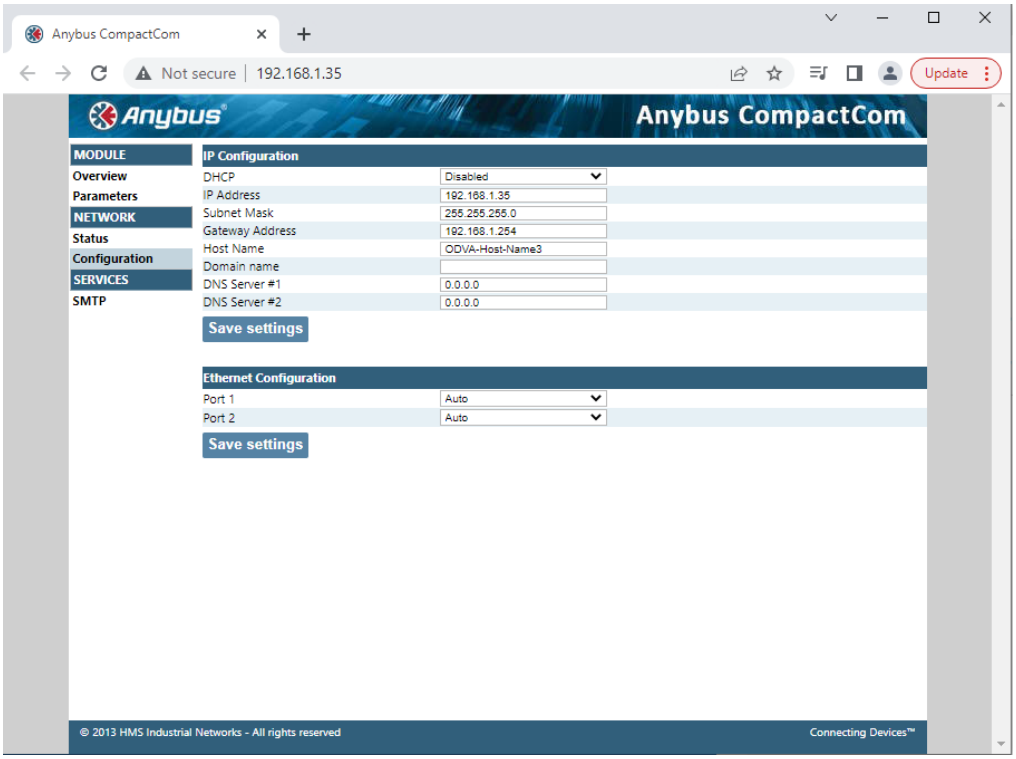


Figure 21: HMS IP Config EtherNet/IP Configuration Tool

    b. Click on Status under NETWORK to see more detailed network information. Click on Configuration under NETWORK to set a static IP address.

    c. Modify the IP configuration and click the Save Settings button once finished.

Viewing EtherNet/IP Data on a Website

The PQConnect board with EtherNet/IP option has the capability to be viewed by using a website. This eliminates the need for a PLC/HMI to access the same data that can be accessed via EtherNet/IP.

Follow these steps for viewing data on a website."

1. Connect your PQconnect board to the ethernet network via an ethernet cable. To change your PQconnect board IP address refer to IP Address Configuration for EtherNet/IP communication section of the manual.
2. Find the PQconnect IP address of the Anybus CompactCom B40 by using Anybus HMS IP config utility application.
3. Open a web browser and go ahead and search for the PQconnect IP address. You should see something like the figure below.
4. To view the PQconnect parameters Click on the Parameters tab on the left-hand side of the website for real-time data of the PQconnect board. For more information refer to section EtherNet/IP Register Map in the manual

Figure 22: PQconnect IP Address

Using PQconnect Board with RSLogix 5000 VIA EtherNet/IP

This example will go through setting up RSLogix 5000 to enable a generic PLC to communicate with the PQconnect board via EtherNet/IP. This is a generic example which should be used as a guide when setting up your system. Any additional information or further questions, please see the RSLogix 5000 user manual or contact the manufacturer.

Required Material

- EtherNet/IP Enabled PQconnect board connected to EtherNet/IP network.
- RSLogix 5000 on a PC or laptop
- EtherNet/IP capable PLC or HMI
- PQconnect EDS file/Add-On Profile

Note: Make sure that the PQconnect board ethernet port is connected to your network along with the PLC or HMI device of your choice.

Option 1: Installing PQconnect EDS File in RSLogix 5000

1. Download the PQconnect EDS file EtherNet/IP EDS File
2. Open the RSlinx "EDS Hardware Installation Tool" typically found in the Windows start menu of your studio 5000 installation. A window like the figure below should appear.

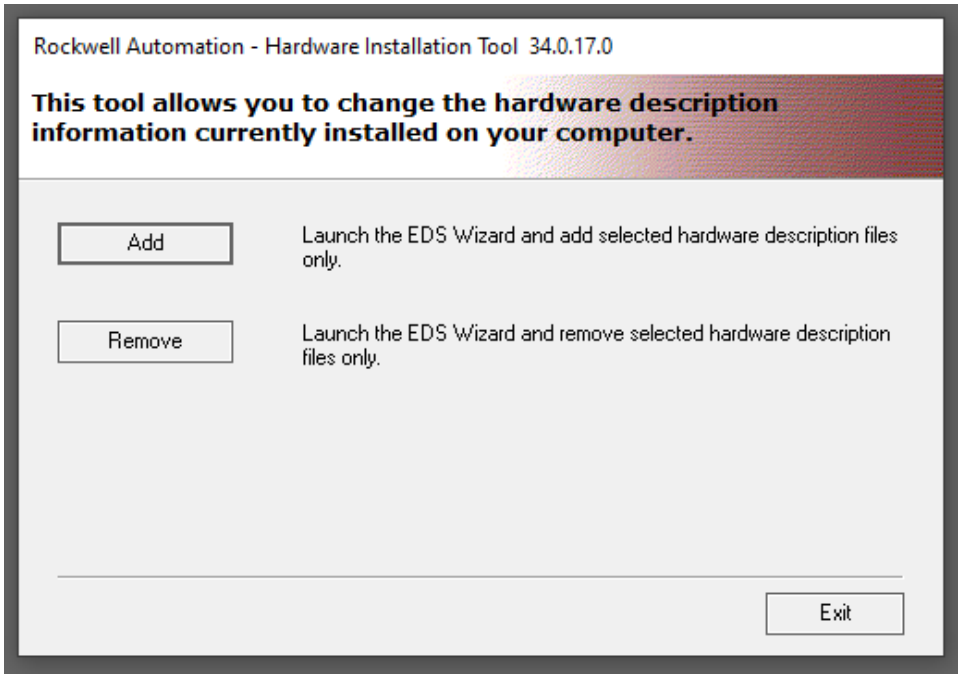


Figure 23: EDS Hardware Installation Tool

3. Click on **Add**. A window will open where you can browse to the EDS file that you downloaded then select the option to "**Register a Single file**". As shown in the figure below.

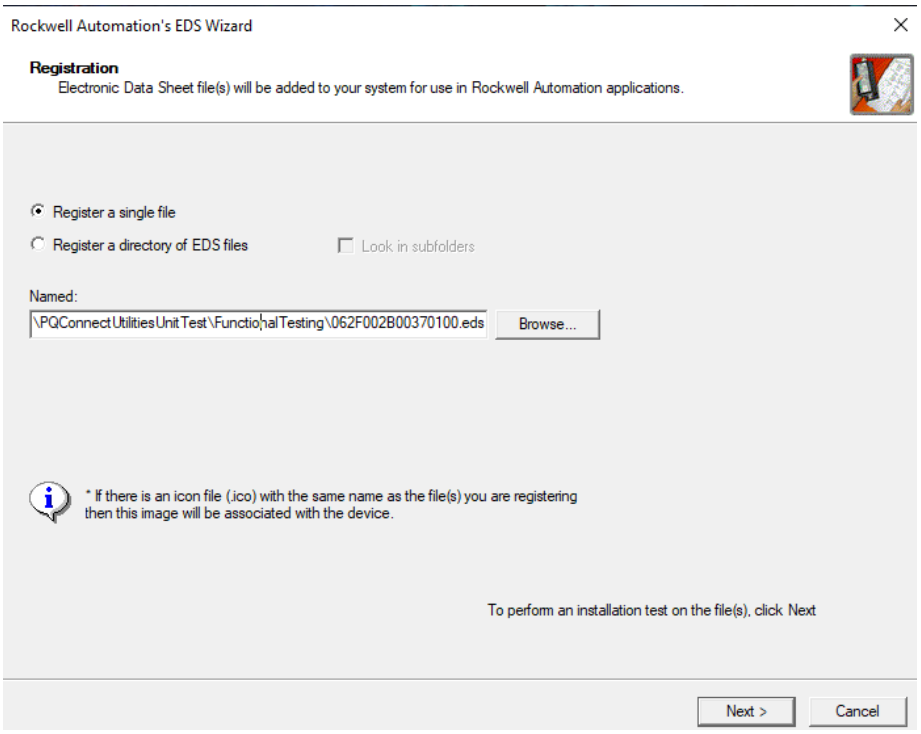


Figure 24: EDS File Registration

4. After selecting the file, click on the Next button and then Next on the next window.
5. A new Window should pop up with the title “Change Graphic Image” as shown in the figure below with the TCI, LLC logo. Leave the icon at its default and click on the Next button.

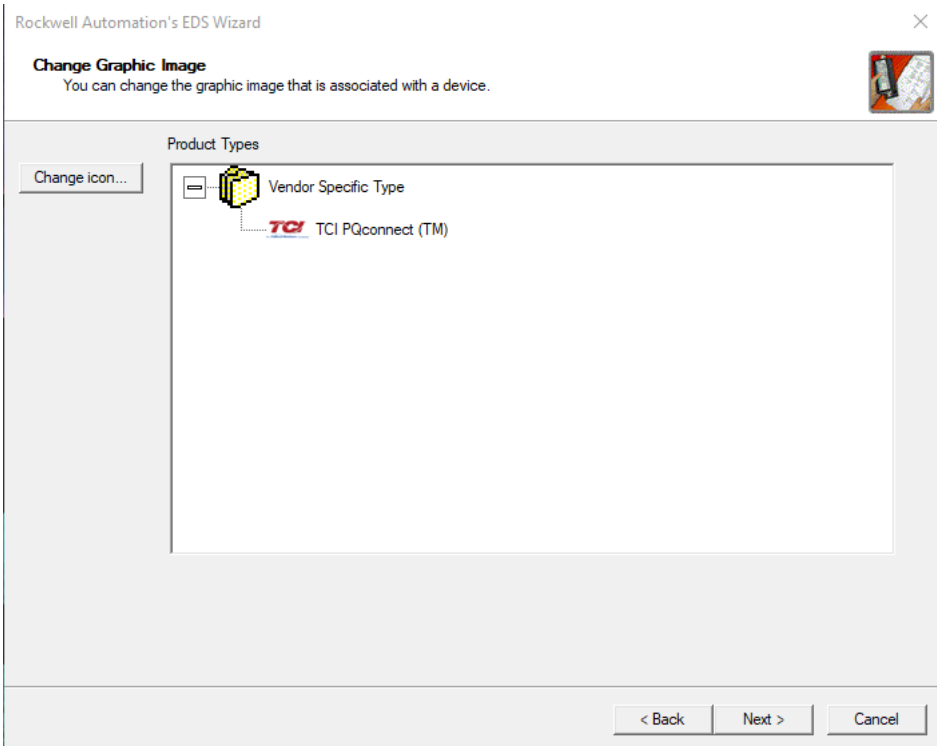


Figure 25: Change Graphic Image Screen

6. Afterwards you should get a new window saying, “Would you like to register the following device” and then the word TCI PQconnect (TM) below that message. Click Next and the PQconnect board will be registered in Studio 5000.

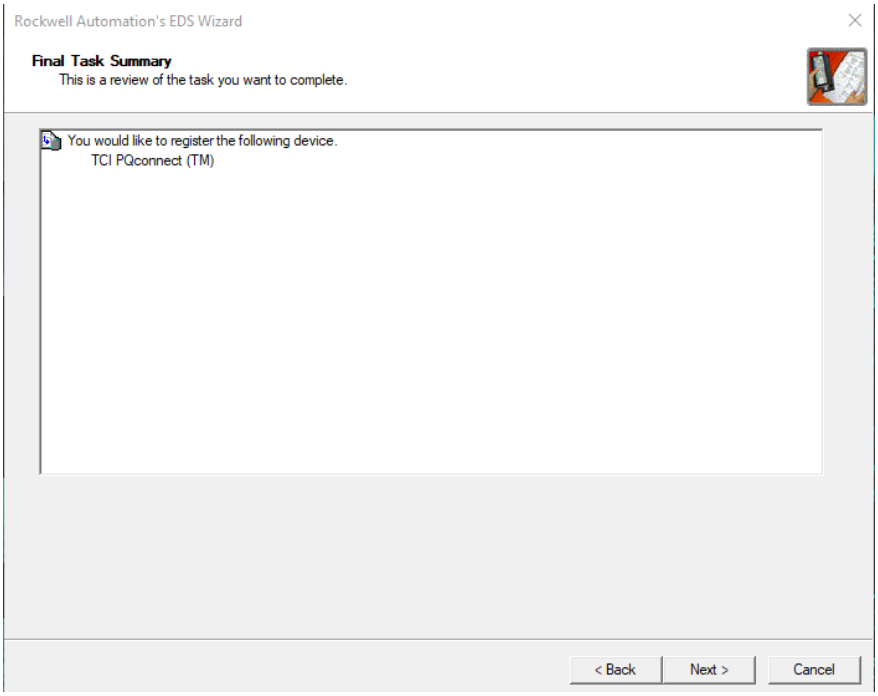


Figure 26: Final Task Summary Screen

7. Click Finish to exit out of the Rockwell Automation EDS Wizard. Then click Exit to exit the EDS Installation Tool.

Adding Harmonic Filter Device in RSLogix 5000 (EDS-Version)

1. Open Studio 5000 and create a new project or open your existing project. Choose your PLC and the number of Expansion I/O modules your PLC has.
2. In the Studio 5000 Controller Organizer window you will see I/O configuration and EtherNet/IP with the name of your PLC and project name underneath. Right click on the ethernet icon and select New Module, like the image below.

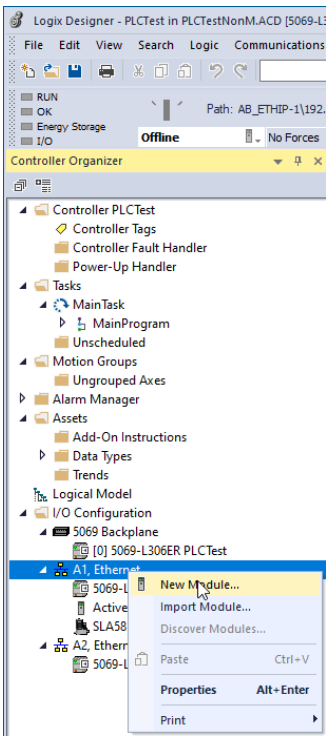


Figure 27: New Module

3. In the Search bar of the Select Module Type, enter “TCI” or “PQconnect” and the PQconnect board in the EtherNet/IP Module Catalog should appear, see figure below.

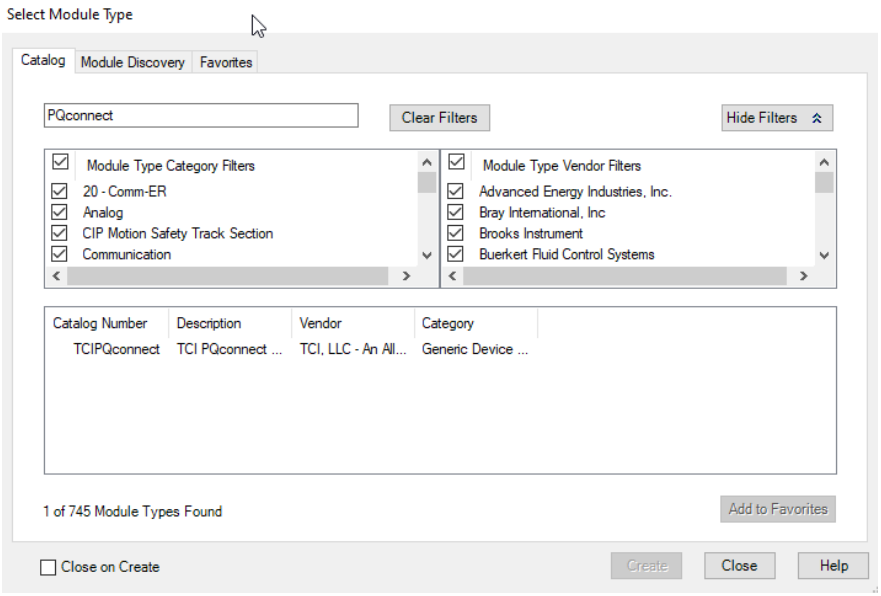


Figure 28: PQconnect Board in Module

4. Select the PQconnect device so that it's highlighted in blue and click on create.
5. A new window like the figure below should appear after the module has been created.

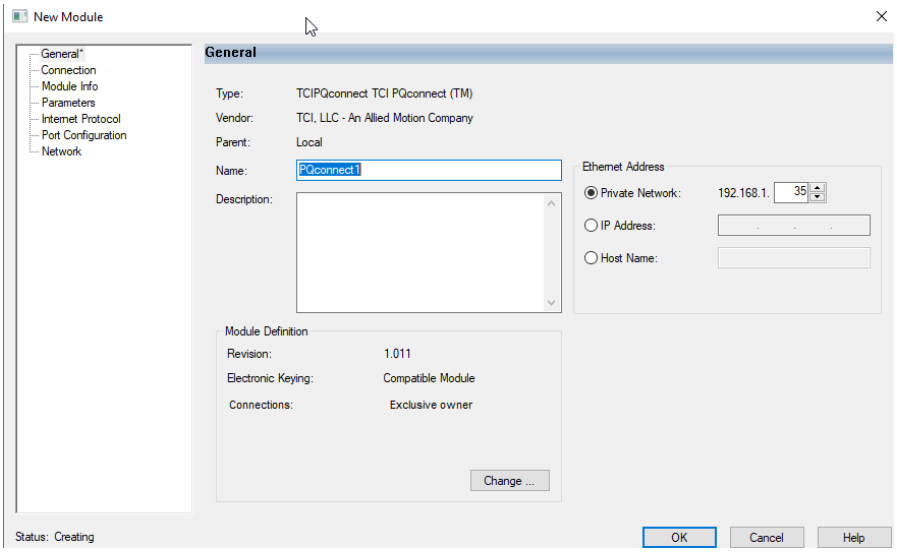


Figure 29: Module Created Screen

6. Enter the name "PQconnect" for the name of the module and enter the IP Address of the PQconnect device that was configured. Optional configurations are possible with the module for the user. Once Done click Ok.
7. The PQconnect device should appear underneath the ethernet section of the Controller Organizer location in the left-hand side of RSLogix 5000, as shown in the figure below.

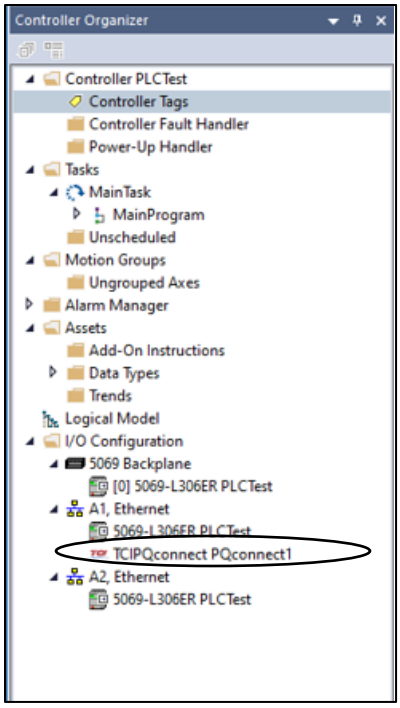


Figure 30: Controller Organizer Location with PQconnect

Viewing Filter EDS Profile and Controller Tags

1. To view PQconnect device EDS Generated Add on profile located the device in Controller Organizer and double clock on the device.
2. The module properties window should pop-up such as the figure below.

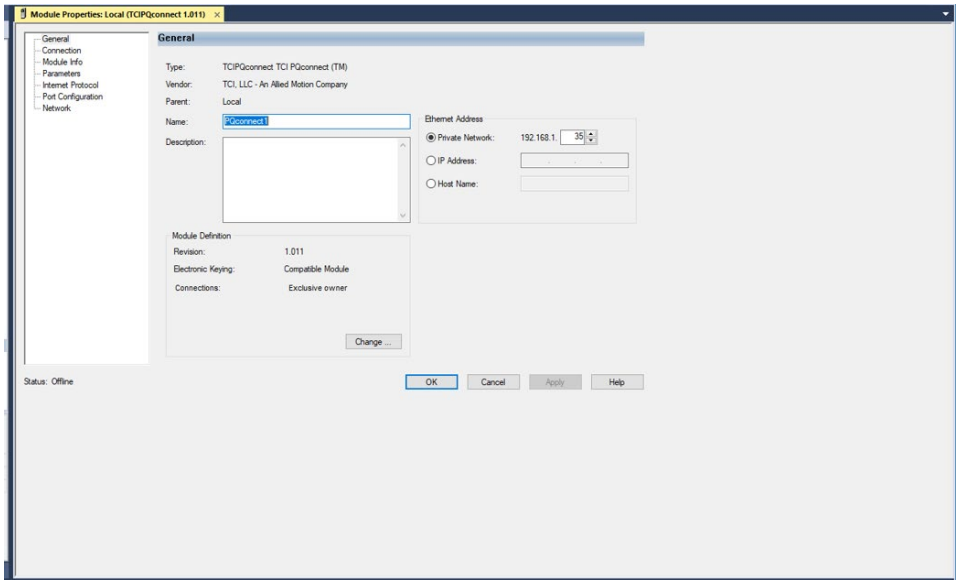


Figure 31: Module Properties Window

3. To view the Parameters of the PQconnect device, locate the Parameters sub section on the left-hand side of the screen and click on that section. The parameter section should be displayed allowing the user access to all the EtherNet/IP enabled parameters name, value, units, and description.

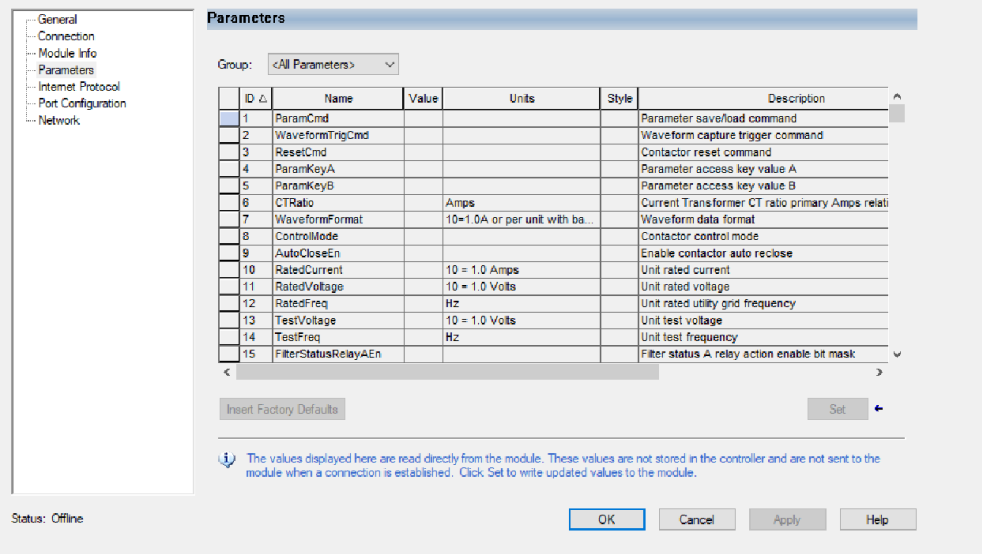


Figure 32: Parametetr Sub Section Screen

4. Parameters can also be viewed based on group selection. An example of the THD group being selected and viewed is shown below.

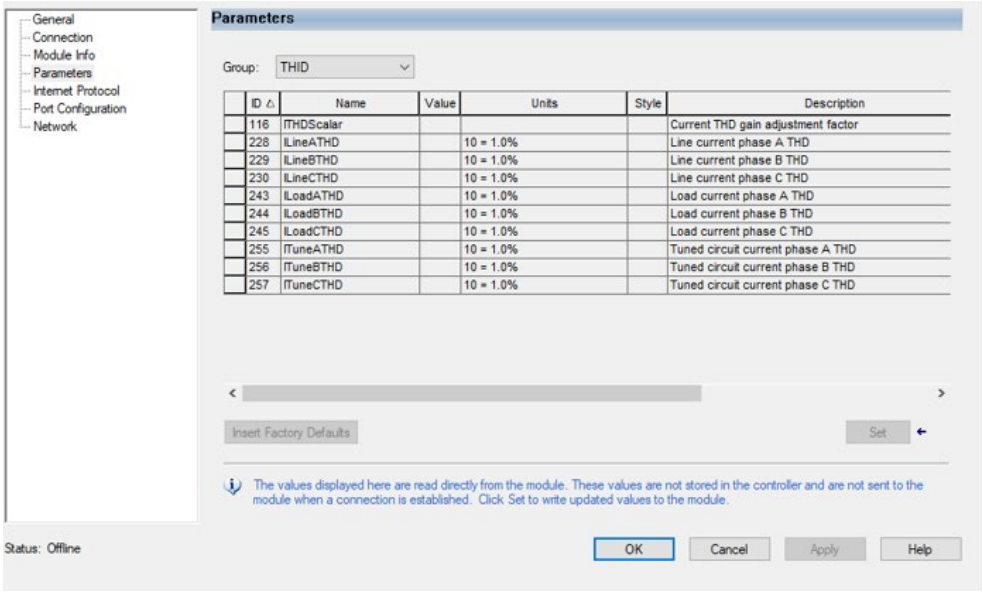


Figure 33: THD Group Selection Screen

5. Other Tabs such as the Module Info will activate once the PLC is running. Go to Communications, Who Active. Select AB_ETHIP-1 and select the PLC. Click Go Online and download the offline project to the PLC.
6. The PLC should be communication with the PQconnect device and reading parameter data. To view the status data of the device, right click on Controller Tags and click on Monitor Tags. A figure should appear like the figure below showing the PQconnect Consuming and Producing Data.

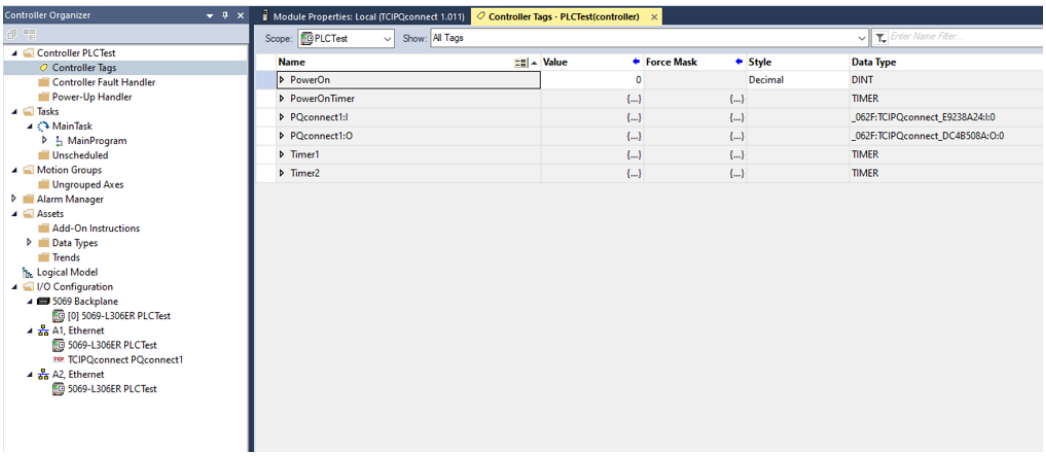


Figure 34: PQconnect Consuming and Producing Data

Unhide the Tags for "**PQconnect: I**" to view the Process Data running. The PQconnect board should be communicating data back and forth such as the line voltages and current. The figure below displays a PQconnect device being run in data simulation mode with Process data running.

As shown, each data location has a corresponding name which matches the EtherNet/IP Register Map Parameters of this manual. Each location also has its predefined datatype with a range specified in its software.

For example, the producing data instance "VLineABRMS" correlates to the Parameter instance **V_LINE_AB_RMS** in PQVision with an I/O Register in PQVision of 30. For more information on V_LINE_AB_RMS parameter refer to the Voltage Register Map.

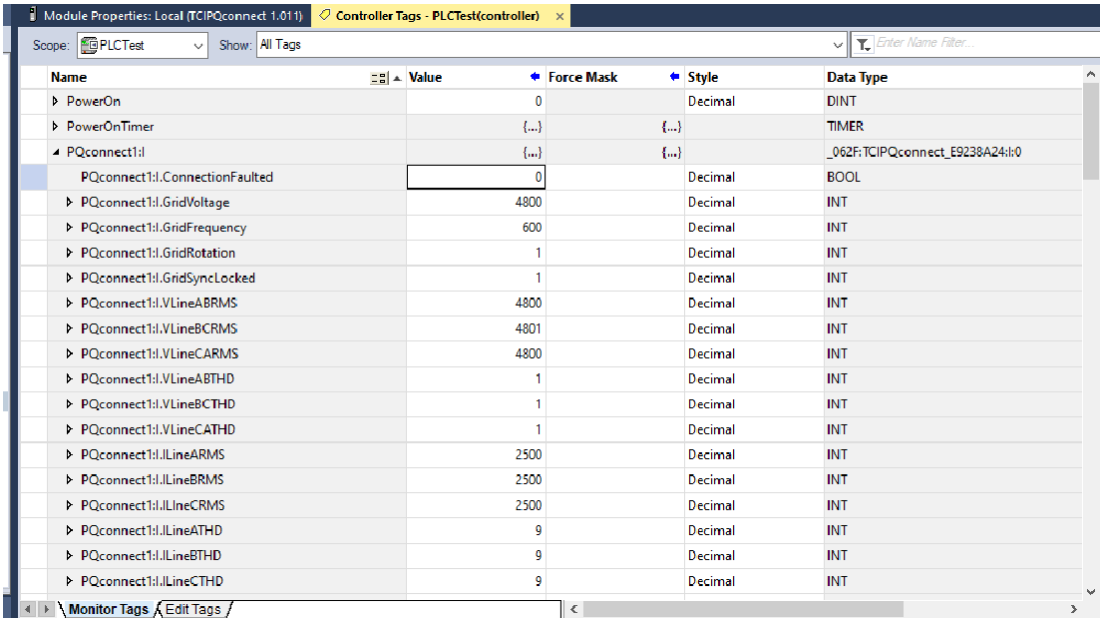


Figure 35: PQconnect in Data Simulation Mode

Option 2: Installing PQconnect AOP in RSLogix 5000

This section covers on how to install the Add-On Profile (AOP) for Harmonic Filter with PQconnect running firmware version *C3 and greater*. The AOP is used to simplify the integration between your harmonic filter with PQconnect and RSLogix 5000, by allowing the RSLogix 5000 software to know which type of module is being used and its custom settings.

1. Close any instances of RSLogix 500 and download the Add-On Profile (AOP) installer from the HGP page: https://www.transcoil.com/products/pqconnect-add-on-profile-aop/.
2. Extract the installation files and double-click the **MPSetup.exe** file to launch the RSLogix 5000 Module Profile Setup.
3. Click **Next** several times, accepting the default selections in most cases.

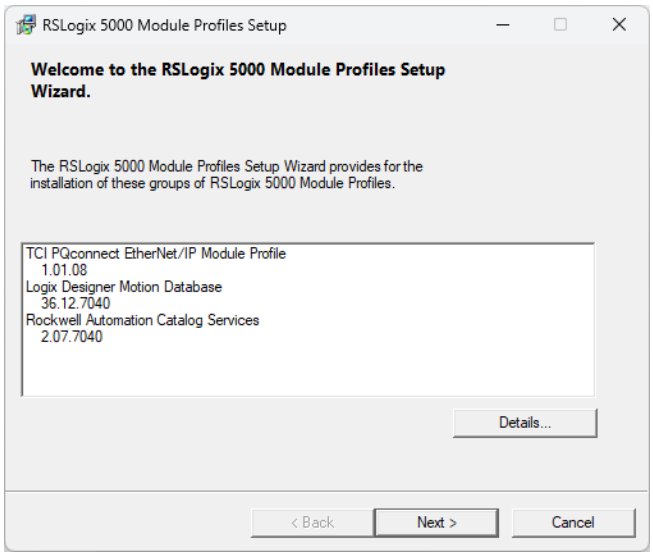


Figure 36: PQconnect Add-On Profile Installation

4. Click **Finish**. You may have to open a new instance of RSLogix 5000 for the AOP to take effect.

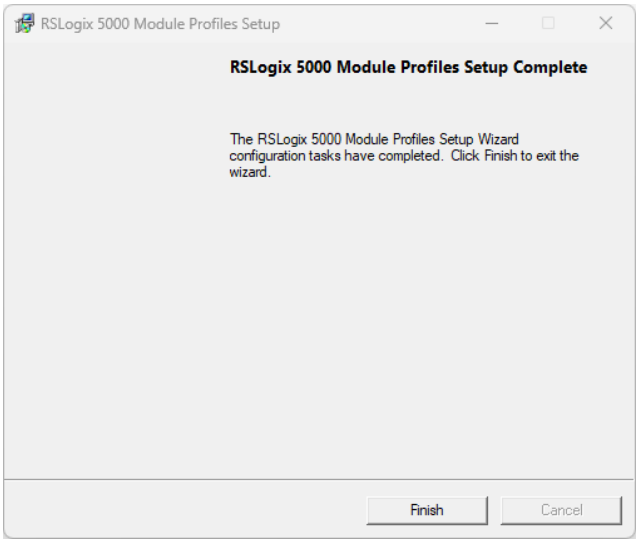


Figure 37: PQconnect Add-On Profile Setup Complete

Adding Harmonic Filter Device in RSLogix 5000 (AOP-Version)

1. Open Studio 5000 and create a new project or open your existing project. Choose your PLC and the number of Expansion I/O modules your PLC has.
2. In the Studio 5000 Controller Organizer window you will see I/O configuration and EtherNet/IP with the name of your PLC and project name underneath. Right click on the ethernet icon and select New Module, like the image below.

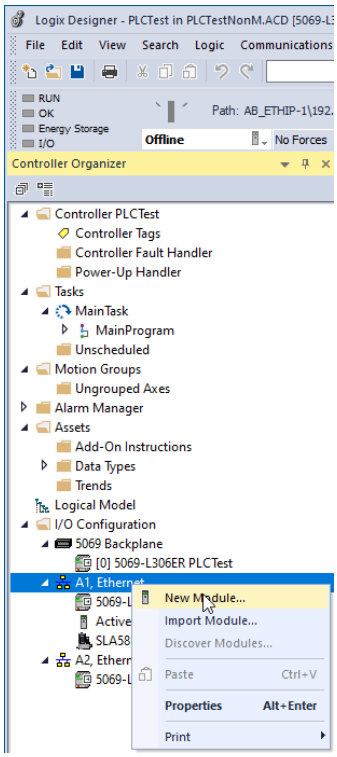


Figure 38: New Module

3. In the Search bar of the Select Module Type, enter “TCI” or “PQconnect” and the PQconnect board in the EtherNet/IP Module Catalog should appear, see figure below.

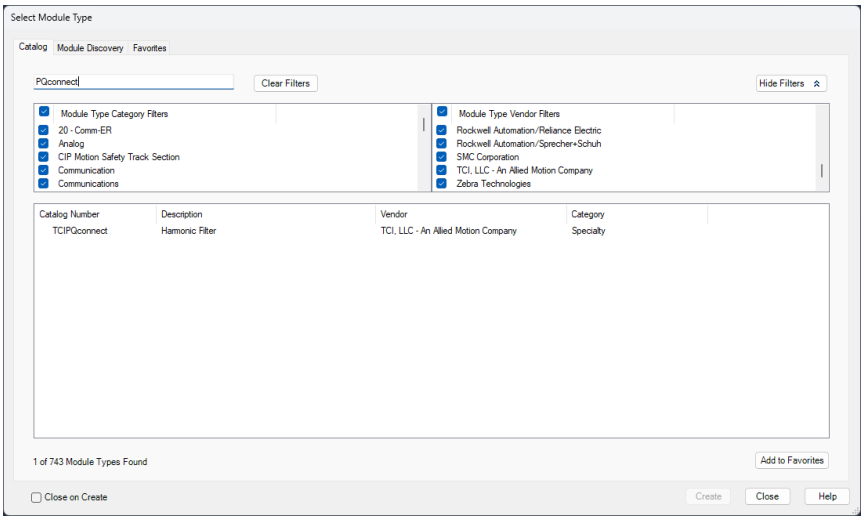


Figure 39: PQconnect Board in Module

4. Select the PQconnect device so that it's highlighted in blue and click on the ***Create*** button.
5. A new window should appear asking the user to define their new device. Enter the name and description of the module that best fits your need and enter the IP Address of the PQconnect device. Optional configurations are possible with the module for the user.

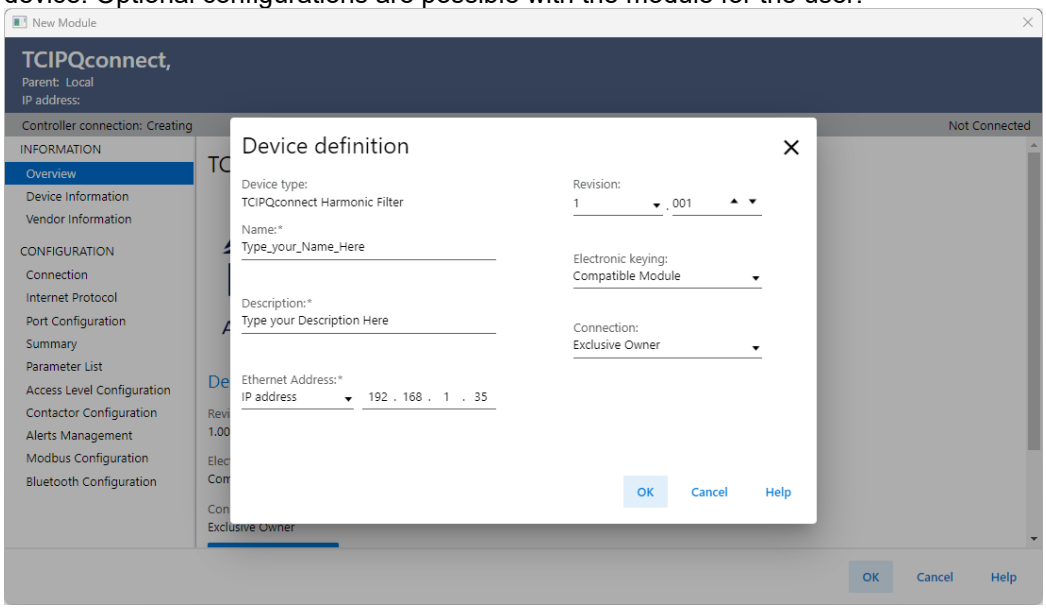


Figure 40: New Module

6. Once configured click ***Ok.*** The recently configured module will be available to the user. Note that most of its configuration pages are not available unless the device is connected or online. *Review the Vendor Page for any Support help that may be required when configuring your device*.
7. Afterwards click ***Ok*** to exit.
8. The PQconnect device should appear underneath the ethernet section of the Controller Organizer location in the left-hand side of RSLogix 5000, as shown in the figure below.

Note: For more information or help on the configuration process the AOP select the Help button on the AOP.

Add-On Profile Summary Page

The Summary page of the AOP gives real-time update of connected harmonic filter status and key parameters such as voltages and currents. This section gives a brief broken of key parameters.

General:

- **Software Version:** Latest Filter's PQconnect software revision
- **Filter Model:** Production type of Harmonic Passive Filter.
- **Serial Number:** Filter's Serial Number found in the product's nameplate.
- **PCB Number:** Filter's PQconnect PCB Number, set by Factory.
- **Rated Current:** Current Rating of the Filter.
- **Rated Voltage:** Voltage Rating of the Filter.
- **Rated Frequency:** Frequency Rating of the Filter.
- **Line Voltage:** Utility Voltage in RMS being measured.
- **Line Frequency:** Utility Frequency in Hz being measured.
- **Line Rotation:** Order in which the voltage waveforms of a polyphase AC source reach their respective peaks. Can be "ABC" or "ACB."
- **Board Temperature:** Filter's PQconnect board temperature.

Filter Line/Load:

- **VRMS:** Filter's alternating current (AC) Root Mean Square voltage.
- **THVD:** Displays the Total Harmonic Distortion of the utility line/load voltage as a percentage.
- **IRMS:** Filter's alternating current (AC) Root Mean Square current
- **THID:** Displays the Total Harmonic Distortion of the utility line/load current as a percentage.

Note: *Line/Load power values are calculated using fundamental values.*

Status Detection:
Filter's Status Alerts for the input, output and of the filter will display according to severity of the alerts. For more information about each alert/fault review the *Alert Management Page*.

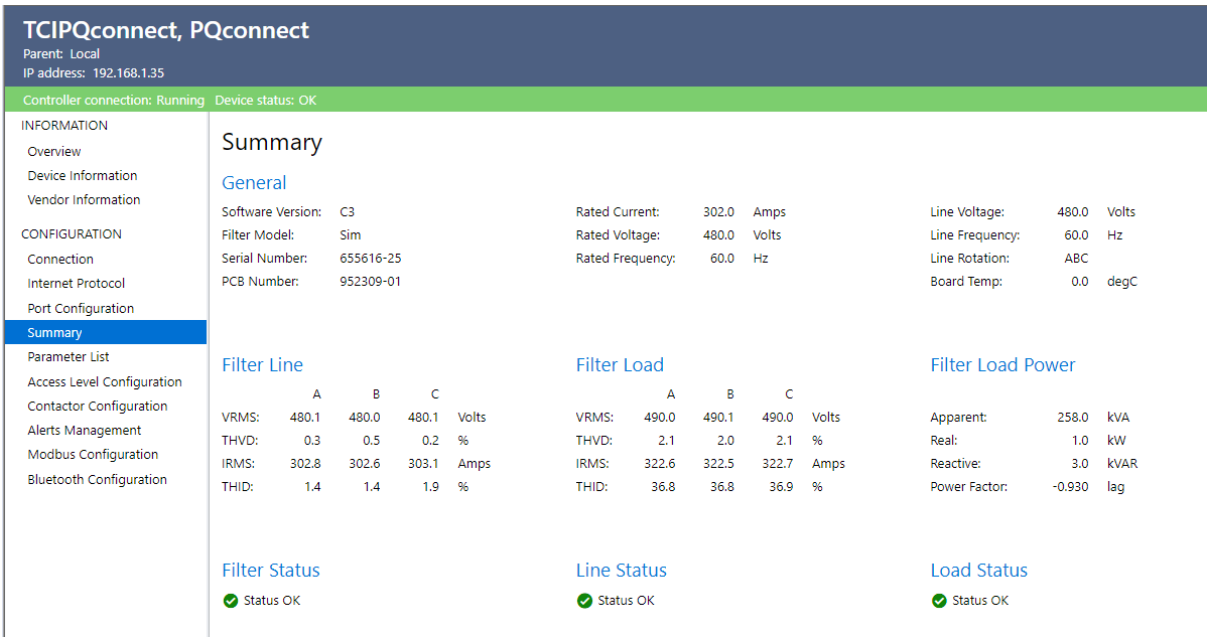


Figure 41:Harmonic Filter AOP Summary Page

Add-On Profile Changing Access Levels

This section focuses on setting the Access Level of the Filter. The Add-On Profile contains several screens that allow the user to monitor and control the status of the Passive filter. Tech Access or Higher is required to view additional screens. This will require the user to have their project running.

1. With Studio 5000 opened and your project being verified to have no errors. Run the Ladder Logic in programming or production mode.
2. After going online double click on your Harmonic Filter device in the *Controller Organizer* in Studio 5000.
3. Select on the *Access Level Configuration Page.*
4. Change the Access Level section to Tech access and under the Password textbox. Enter **08252014** to enable tech access.
5. Select *Log In* after a moment the current access level should change to tech access.

Note: *If the Harmonic Passive Filter is connected via Bluetooth, the filter access configuration settings will return to the Basic/User access level. The mobile app access level will be the highest priority if connected, and the access level must be changed via the mobile app.*

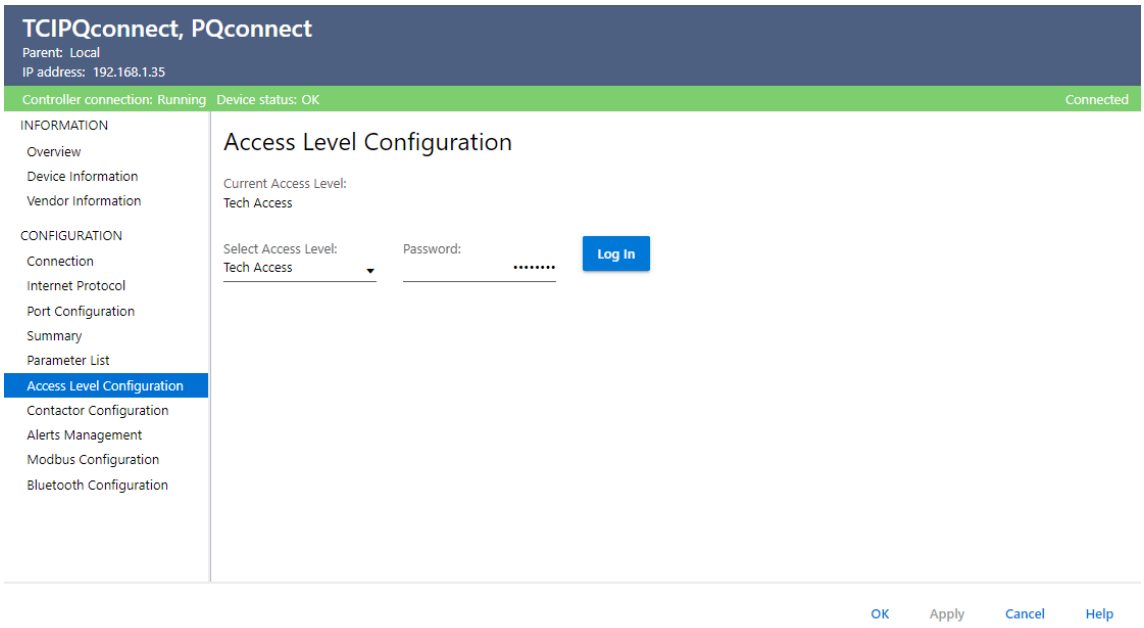


Figure 42: AOP Successful Access Level Configuration Example

Add-On Profile Parameter List Page

This section focuses on viewing and editing feedback and setpoints that are reported by the Filter's PQconnect device. The window features three primary parameter statuses: Parameter, Contactor, and System Status. Select an option through the Parameter Group Filter combo box. All parameters get updated once when entering the Parameter Group and can be refreshed anytime by clicking the "**Refresh**" button.

Parameter Structure:

- **Instance ID:** Each parameter has an unchangeable, unique EtherNet/IP Instance ID.
- **Name:** Parameter Name. EtherNet/IP Parameter name is different from the Modbus Name.
- **Value:** This is the value the parameter is currently being read or set to.
- **Units:** Unit value of parameter. It can be a percentage (%), A/10, V/10, or Celsius.
- **Default:** Default value for the parameter from the Filter's PQconnect Device.
- **Min:** The parameter's Minimum value can be set via the Parameter List Table.
- **Max:** The parameter's Maximum value can be set via the Parameter List Table.
- **Description:** Describes the overall use of the EtherNet/IP Parameter Instance.

***Note**: Viewable parameters that are shown are based on the Users access level. If the parameter, you are looking for cannot be found you may require a higher access level.*

Reading A Parameters:
All parameters available in the parameter list groups are readable. Parameters are only readable and not settable are called as Feedback parameters. All parameters are refreshed by clicking the "Refresh" button.

Setting/Editing A Parameters:
All parameters available in the parameter list groups are readable but not settable. Parameters are readable and settable/editable are called as Setpoint parameters. Parameters that can be written to will have the "***Edit***" columns enabled if the proper access level has been provided. Parameters are only allowed to be modified. By selecting the "***Edit***" button, the user can go ahead and write a new value to the parameter that exists within its min and max values. After editing a parameter, the "**Set**" arrow icon will be enabled. The user can then write the request value to the Filter after being set to.

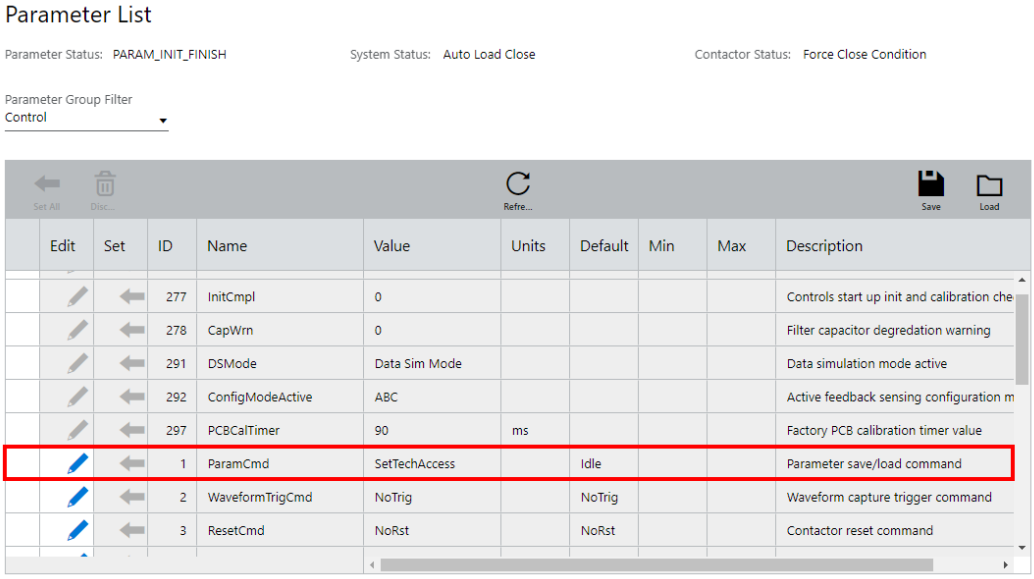


Figure 43: Editing Parameter ParamCmd

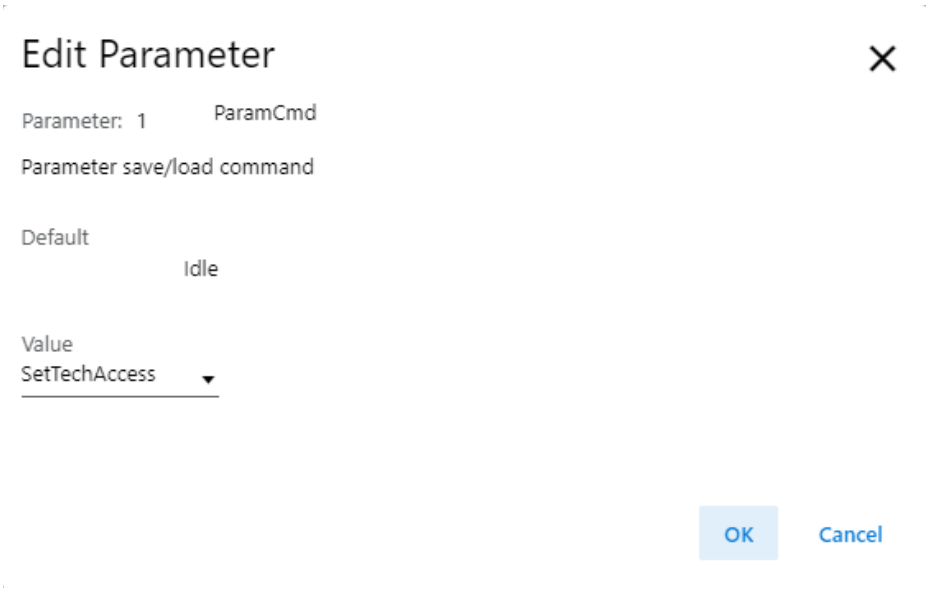


Figure 44: Edit Parameter Screen For ParamCmd

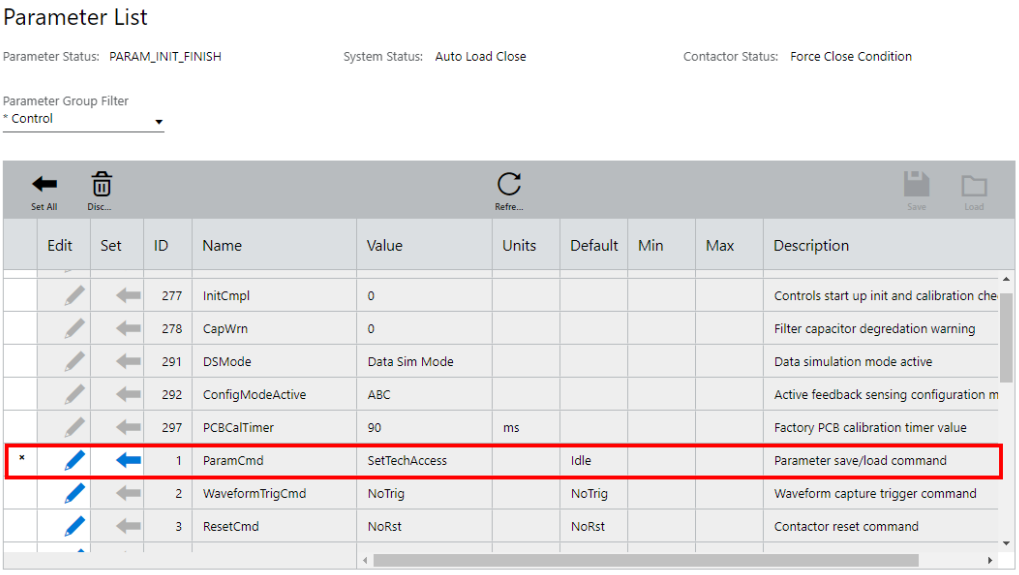


Figure 45: Setting Parameter ParamCmd After Editing

Saving & Loading Parameter List:
Press the "**Save**" button to save the Filter's Parameter List. Upon clicking this, a file dialog browser will appear, prompting the user to select a file location for the .csv file to be saved. The parameter list will then be saved as a .csv spreadsheet. Technicians can also load a stored file's parameters to the Filters from the AOP or from PQvision version 1.7.0 or higher. This feature is useful when a user corrupts the Filter's parameter table and saves its settings afterward.

Add-On Profile Contactor Configuration Page

The Contactor Configuration page provides a way to configure the internal Contactor of the passive filter. The Contactor is an electronically controlled switch that disengages and engages the harmonic filter's tuning circuit, designed to eliminate most harmonic frequencies. The overall sequence in which the filter goes through is described below:

1. The Contactor Mode Setting dictates the contactor state if there are no Alerts.
2. The Contactor Mode Setting generates a command to change the Contactor State.
3. When the command to change the contactor state occurs, the filter waits for the Open Delay or Close Delay time to pass.
   i. And if the Contactor is commanded to Open, the Open Delay time has passed, and the Contactor opens.
   ii. Or if the Contactor is commanded Closed, the Close Delay time has passed, the filter ensures the Contactor reclose timer has passed, and then the Contactor Closes.

***Note**: Make sure to save your filter's settings to make your contactor changes final.*

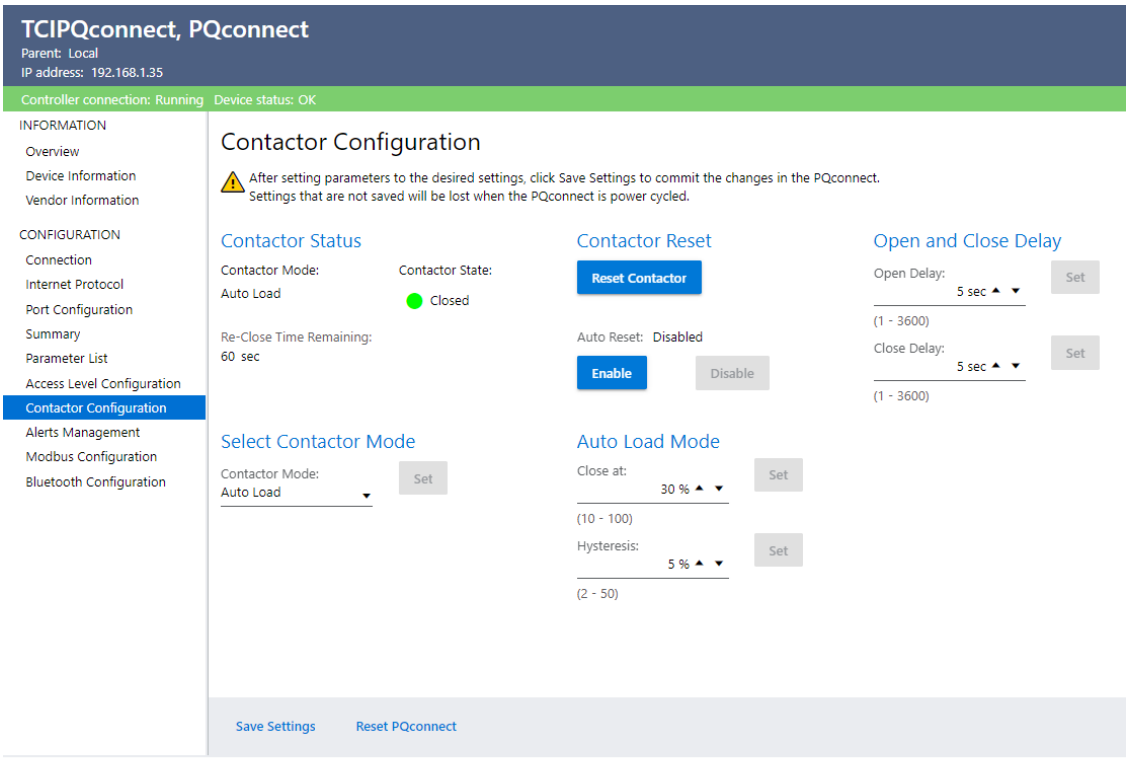


Figure 46: Harmonic Filter AOP Contactor Configuration Page

Contactor Reclose Timer:

The Contactor must always wait **2 minutes** before reclosing after opening. This safety feature ensures the user does not open and close the contactor for short durations.

Open & Close Delay:

For the various contactor control modes, there is a customer-settable time delay for the contactor to open and close. A condition that would change the state of the contactor must last longer than the set delay for it to have an effect. This is important to prevent high frequency switching of the contactor, which reduces its longevity. This delay time can range from 1 to 3600 seconds for both Open and Close delay times.

Contactor Reset:
This manually resets the contactor state and resumes normal operations. It should be selected after an Alert (alarm/fault) condition has occurred and been cleared. This is useful when the auto-reset functionality has been turned off.

Auto Reset Enabled/Disabled:
If enabled, the contactor will automatically reset **5 minutes** after an **alert condition has been cleared**.

Contactor Control Mode Selections:

- **Force Open –** Forces the Contactor to open permanently after Open Delay time.
- **Force Close –** Forces the Contactor to close permanently after Close Delay time.
- **Auto Load–** Automatic contactor mode. It will force the contactor to close when the filter load percentage reaches the Auto Mode Close Threshold. Likewise, if the measured percentage of the load is less than its selected close threshold value, the contactor will automatically open. The load hysteresis threshold can be used to decide at what load percentage the contactor recloses. For example, with a Close Threshold of 30% and Load Hysteresis of 5%, the contactor will close when the filter loading exceeds 30% load, but the contactor will not open until the loading falls below 25% load.
- **Relay–** Forces the Contactor to open or close based on a signal from Relay Pin J7/J8 on the PQconnect board. For example, if the close threshold of the contactor is 30% and the load hysteresis threshold is at 5%. The contactor will close when the filter loading exceeds 30% load, but the contactor will not reopen itself until the loading falls below 25% load.
- **Auto kVAR–** Automatic contactor mode. It will force the contactor to open when the filters' input capacitive kVAR (not inductive kVAR) exceeds the Target kVAR Setpoint. A target hysteresis setpoint can be used to decide when the contactor recloses. For example, if the Target kVAR Setpoint is 54 and the Target kVAR Hysteresis is 10. The contactor will open when the Filter's input kVAR exceeds 54 kVAR, but the contactor will not close until the Filter's input kVAR falls below 44 kVAR.
- **Debug Force Close–** Automatic contactor mode. It will force the contactor to close regardless of any active faults being active. After 15 minutes the PQconnect board will go back to its previous Contactor Mode or until another mode is selected. **It is recommended not to set this Contactor Mode unless explicitly told by a Tech-Support Engineer. Unknown damage could be done to the filter. This mode is only available for Filter's with PQconnect firmware C3 and above.**

Save Settings
It saves any modified settings so that they remain after a power cycle. Saving the settings will automatically open the contactor.

Reset PQconnect
An easy and effective way to power cycle the Filter's PQconnect board. Any unsaved settings will be lost. Resetting the board will open the contactor if the contactor state is closed.

Add-On Profile Alert Management Page

The *Alert Management Table* describes and provides a means to change how the filter responds to certain status conditions and what events trigger them. All possible alert statuses that can be incurred during operation are listed in the table. Typically, a user will leave the table to its default settings but can turn off/on certain statuses, which can be helpful in some specific applications.

However, suppose a status condition gets triggered during the regular operation of the filter. In that case, the “Summary” screen of the Add-On Profile Status section will display the most recent fault along with a coloring coding scheme of the severity of that status. A blue status condition is considered an informational indicator; yellow status conditions are caution indicators. These active alerts should be managed as soon as possible.

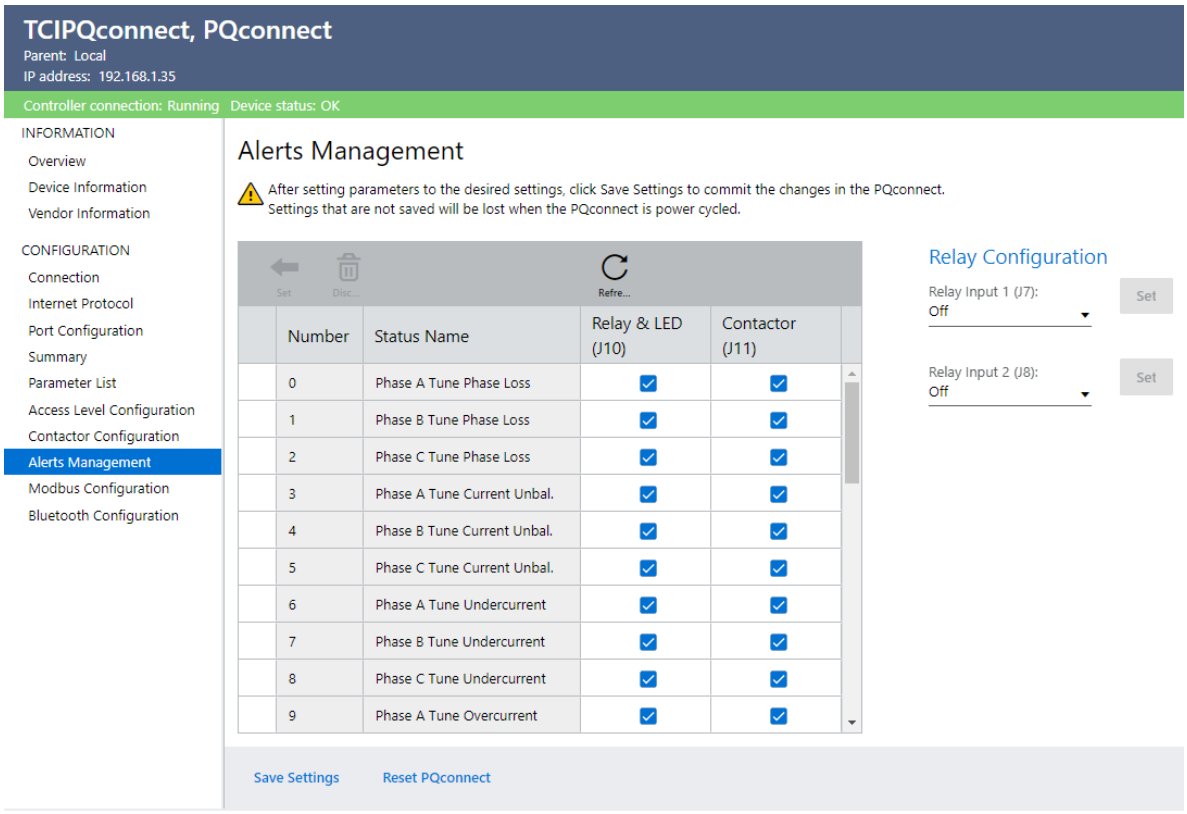


Figure 47: Harmonic Filter AOP Alert Management Page

Alert Event Options:

Two main events can be configured for each Alert option in the list of checkboxes: "*Relay & LED*" and "*Contactor*." When the *“Relay & LED”* option is selected, the PQconnect board inside the filter will illuminate an LED and close the custom relay output, allowing the user to connect to an external device. On the other hand, choosing the *'Contactor'* option will automatically open the filter's internal contactor when the status condition is met, resulting in the removal of the tuned circuit from the filter's circuit.

Alert Status Table:

Below is the list of alerts the Filter monitors and the parameters under which they are categorized (e.g., Status Line, Status Filter, Status Load). These parameters can be thought of as the generated statuses triggered by the environment in which the filter is placed.

The preferred order for listing the status detection options is defined as follows:

Priority	Alert	Alert Severity
0	Phase A Tune Phase Loss	Caution
1	Phase B Tune Phase Loss	Caution
2	Phase C Tune Phase Loss	Caution
3	Phase A Tune Current Unbal.	Caution
4	Phase B Tune Current Unbal.	Caution
5	Phase C Tune Current Unbal.	Caution
6	Phase A Tune Undercurrent	Caution
7	Phase B Tune Undercurrent	Caution
8	Phase C Tune Undercurrent	Caution
9	Phase A Tune Overcurrent	Caution
10	Phase B Tune Overcurrent	Caution
11	Phase C Tune Overcurrent	Caution
12	Under Temperature	Information
13	Over Temperature	Information
14	CPU Fault	Caution
15	Tune Reactor Thermal SW	Information
16	Reclose Limit	Information
17	NCP Fault A	Caution
18	NCP Fault B	Caution
19	Line Reactor Thermal SW	Information
32	Phase A Line Phase Loss	Information
33	Phase B Line Phase Loss	Information
34	Phase C Line Phase Loss	Information
35	Phase A Line Overvoltage	Information
36	Phase B Line Overvoltage	Information
37	Phase C Line Overvoltage	Information

Priority	Alert	Alert Severity
38	Frequency Mismatch	Caution
39	High Voltage THD	Information
40	Phase Rotation	Information
48	Phase A Load Current Unbal.	Information
49	Phase B Load Current Unbal.	Information
50	Phase C Load Current Unbal.	Information
51	Phase A Load Overcurrent	Information
52	Phase B Load Overcurrent	Information
53	Phase C Load Overcurrent	Information

Relay Input 1 & 2:
Two Input relays are available to the Filter to alert the user if the terminals J7/J8 are shorted. An external relay (not on the PQconnect) can provide a signal to the PQconnect's "Relay Input 1" & "Relay Input 2". The Contactor Control Mode must be set to 'Relay" to use this feature.

External Input defines the relay as an input for the contractor if it is in relay-controlled mode. If both relays are configured as External Input, their input is treated as either or. The table below gives a general overview of Relay Input Settings options.

"*Tune Thermal SW*" and "*Line Thermal SW*" indicate that the relay is tied to a thermal sensor switch on either the tuning or mainline voltage lines. A signal from the relay in these modes will trigger the associated event in the system.

Relay Input Options	Terminals are shorted	Terminals are un-shorted
Tune Thermal SW	No Alert, Temperature is normal	Alert Triggered, Temperature is high
Line Thermal SW	No Alert, Temperature is normal	Alert Triggered, Temperature is high
Reset Command	No change	Reset Alerts & resume normal operation
External Input	Contactor instructed to Open	Contactor instructed to close

The Relay Input option "*Reset Command*" will reset the contractor back to its configured mode if it was triggered open by a fault or other means. This is the same action as pressing "*Reset Contractor*" on the Contractor Control Screen.

Add-On Profile Modbus Configuration Page

The Modbus Configuration Page allows the user to change the Filter's Modbus Settings. When changing the device's Modbus settings, the user will select ***apply*** and ***save*** settings after configuring. Afterward, the user must ***reset*** the board by selecting "***Reset PQconnect***."

One thing to note is that the slave address, baud rate, and parity settings must be the same on both the PQvision Desktop and the device for the communication to work via PQvision desktop.

Modbus Settings:

- **Slave Address:** Filter's PQconnect Modbus Address, lets the board know to whether or not to ignore the message.
- **Baud Rate:** Baud rate is the speed of communication. The default value is 115200.
- **Parity:** Used for error detection. Must match that of the master Modbus settings.

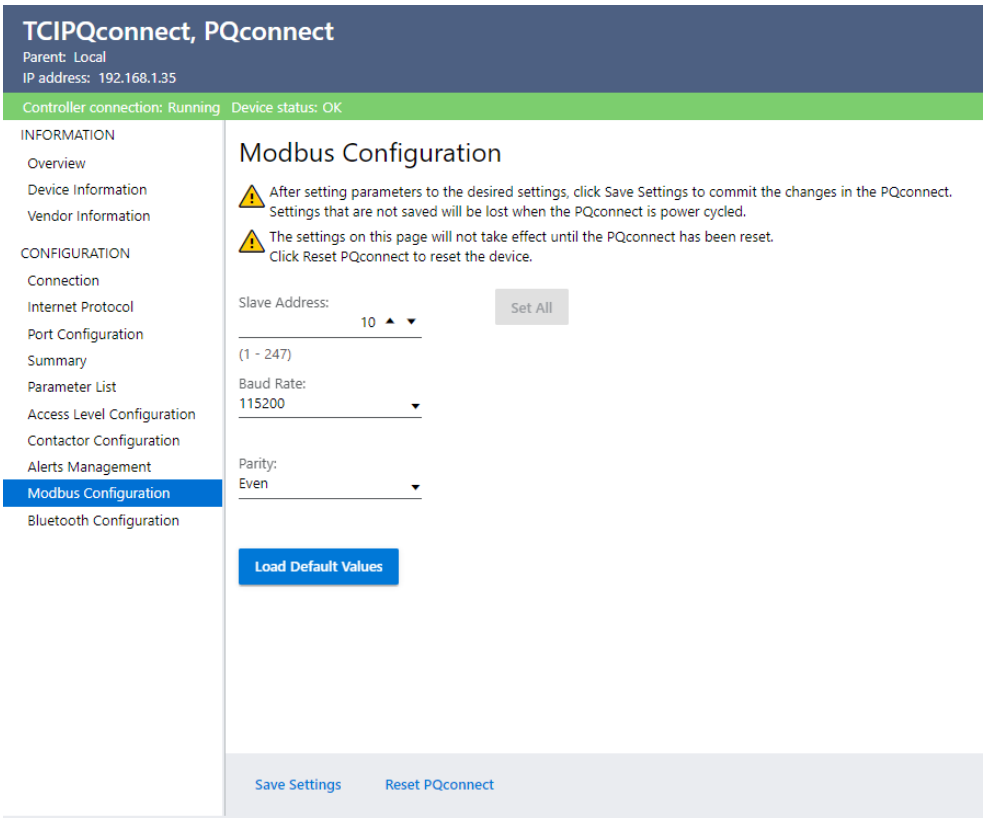


Figure 48: Harmonic Filter AOP Modbus Configuration Page

Add-On Profile Bluetooth Configuration Page

The Bluetooth section provides configuration options for the onboard Bluetooth device on every harmonic filter. Bluetooth will be enabled by default, and users can turn the Bluetooth module on or off at tech and factory access. Technicians can also modify the device identifier to a unique numerical value ranging from 0 to 99; however, this will require the user to save the settings afterward. Users can also view the current wireless passkey of their filter and or change it if needed.

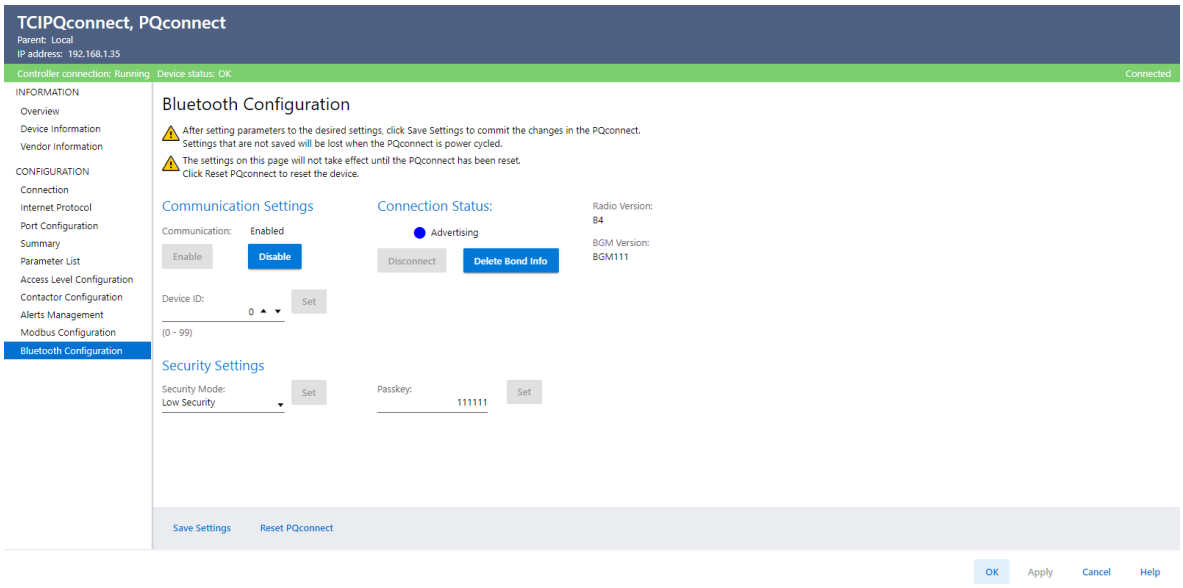


Figure 49: Harmonic Filter AOP Bluetooth Configuration Page

Device ID: The Bluetooth numeric identifier allows PQvision mobile to identify different filters within a 100ft range. The range for this Bluetooth Device ID is 0-99.

Security Options: The Filter's Bluetooth device can be set to use basic or high security. Depending on the security level, the security settings will change to match the expected configuration.

- Under basic security, the passkey used to connect via Bluetooth will match the Filter's serial number. It can be changed via PQvision Desktop and the Add-On Profile, but it is not recommended unless warranted.
- Under high-security access, the Filter has the option of accepting and denying any new connections, and a randomized passkey is created for every new connection. The current connection status of the Bluetooth module is also described and shown on the Bluetooth settings menu, which can be changed from connected to idle to not connected.

Connection Status Options: The Filter's Connect status will determine if it is paired with another device. Possible Connection statuses are *Idle, Advertising, Connected, Not Responding, Radio Disabled, and Firmware Mismatch*.

***Note**: The Connection Status Option, Not Responding, Radio Disabled, and/or Firmware Mismatch will only be detectable for PQconnect firmware version RevC3 and above.*

Save Settings: Saves any modified settings so that they will remain after a power cycle. Saving the settings will automatically open the contactor.

Reset PQconnect: An easy and effective way to power cycle the Filter's PQconnect board. Any unsaved settings will be lost.

Using Explicit Controller Messaging

To leverage Explicit Controller Messaging in Studio 5000, follow these steps to establish efficient and direct communication between controllers.

1. Begin by navigating to the “Controller Tags” section in the project tree and configure the necessary tags for your messaging application.

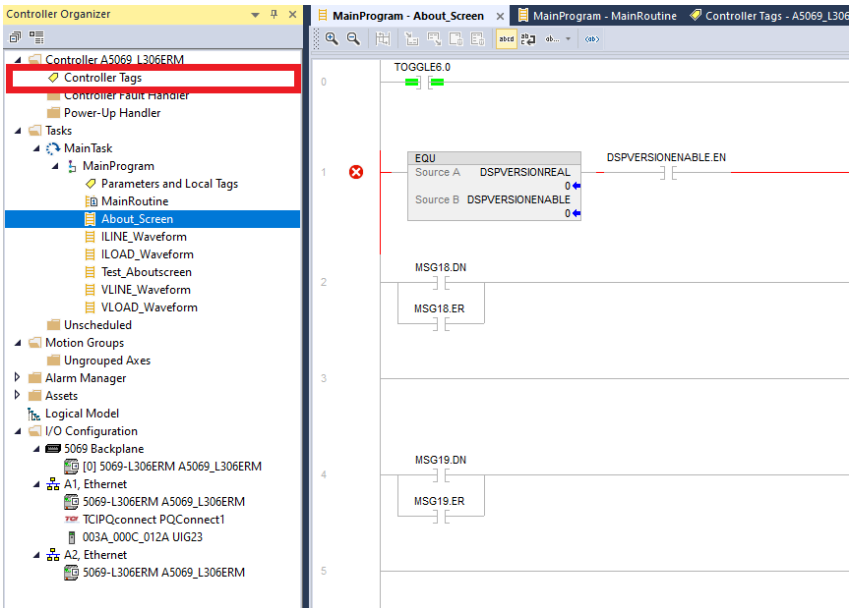


Figure 50: About Screen

2. Next, access the “Communication” tab within the tag properties and enable “Explicit Controller Messaging”.
3. Import your PQconnect Controller under “I/O Configuration” Section in the Project Tree, make sure you select your ethernet section. Follow Viewing the PQconnect device in RSLogix 5000.
4. Once configured, incorporate these tags into your ladder logic or structured text routines to initiate explicit messaging transactions by utilizing the messaging functions providing by Studio 5000 to send and receive data between controllers. Below is an example of Message Block configuration for getting any Parameter in the PQconnect Board. Note: **Make sure to set your Communication Path to your device name**. For instance, number review EtherNet/IP Register Map Section of this Manual.

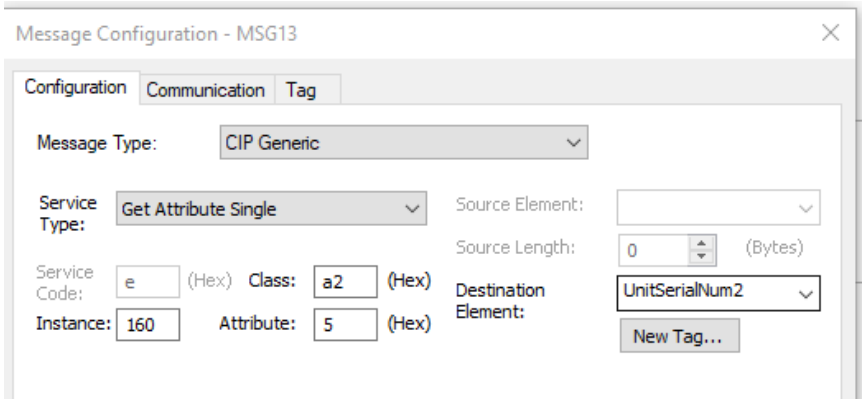


Figure 51: Message Block Configuration

Regular monitoring and thorough testing of explicit messaging interactions within Studio 5000 will help you optimize the performance of your industrial automation system and streamline inter-controller communication.

Using Implicit Controller Tags

In Studio 5000, Implicit Controller Messaging offers a seamless way to establish communication between various devices within an industrial automation system. To implement Implicit Controller Messaging follow the steps below:

1. Start by creating and configuring the necessary I/O tags in the "Controller Tags" section of the project tree. These tags will represent the data you intend to **exchange between devices**.
2. Import your PQconnect Controller under “I/O Configuration” Section in the Project Tree, make sure you select your ethernet section. Follow Viewing the PQconnect device in RSLogix 5000.
3. Utilize ladder logic or structured text routines to read and write data to the configured I/O tags. As the data is exchanged automatically based on the configuration, there is no need for explicit commands to initiate communication.
4. Validate that the parameter “PROC_DATA_CMD_EN” is set to 1 in your PQconnect device.

Regularly monitor the data flow and use diagnostic tools provided by Studio 5000 to troubleshoot any communication issues. Implicit Controller Messaging streamlines data exchange, contributing to efficient automation processes and enhanced connectivity in your industrial setup.

Reading and writing to PQconnect Waveform Arrays

The waveform data displayed by the PQconnect is available over EtherNet/IP using the ADI object class with the code **0xA2** to access data. To implement Explicit PQconnect Waveform Arrays follow the steps below:

1. Begin by navigating to the “Controller Tags” section in the project tree and configure the necessary tags for your messaging application. Make sure that the data type and style matches the Waveform array you are attempting to get. For example, for accessing **VLineBCPlot** for Read/Write the datatype should be **INT** for an array size of **192** bytes. An example is shown below:

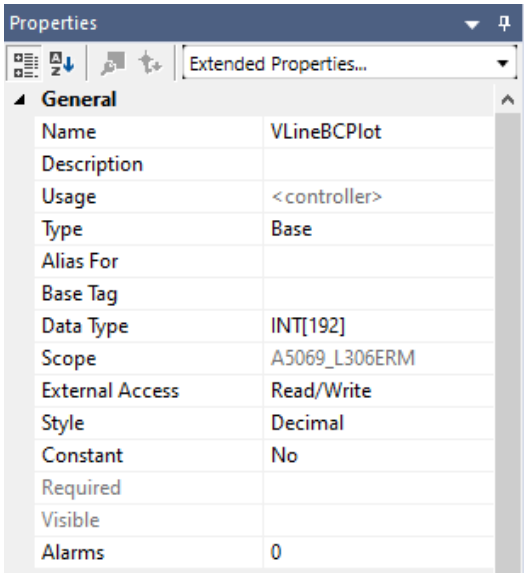


Figure 52: VLineBCPlot for Read/Write

2. Once configured, incorporate these tags into your ladder logic or structured text routines to initiate explicit messaging transactions by utilizing the messaging functions providing by Studio 5000 to send and receive data between controllers. Below is an example of Message Block configuration for getting any Parameter in the PQconnect Board. Note: **Make sure to set your Communication Path to your device name**. For instance, number review EtherNet/IP Waveform Data Section of this Manual. An example is shown below for **VLineBCPlot** waveform array.

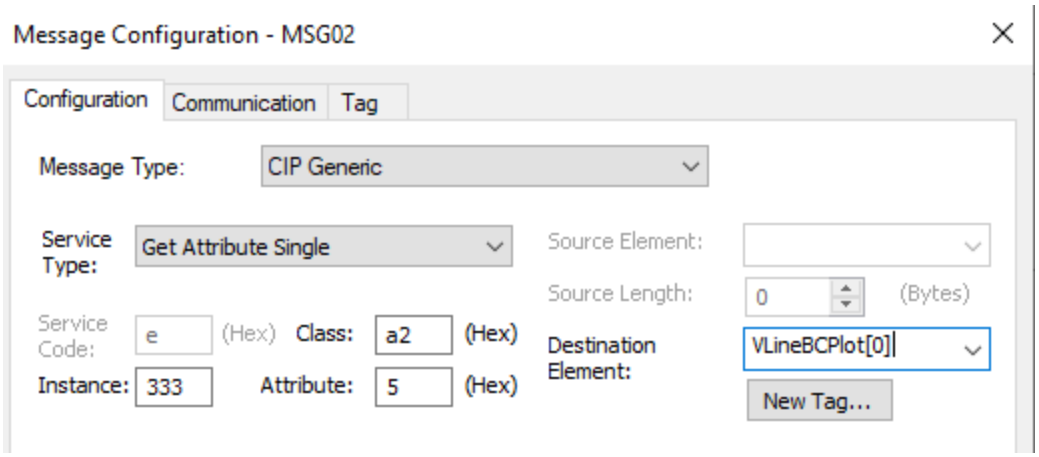


Figure 53: VLineBCPlot Waveform Array Example

3. This will gather all the data for the waveform array. To grab one value of the array at every index. A counter and move function block will have to be used in order to get store one value in a controller tag. A sample Ladder logic for this is shown below for **VLineBCPlot**. Note: **Local tags were created in this process for the CTU and MOV function block. Along with an INT controller Tag VINEB.**

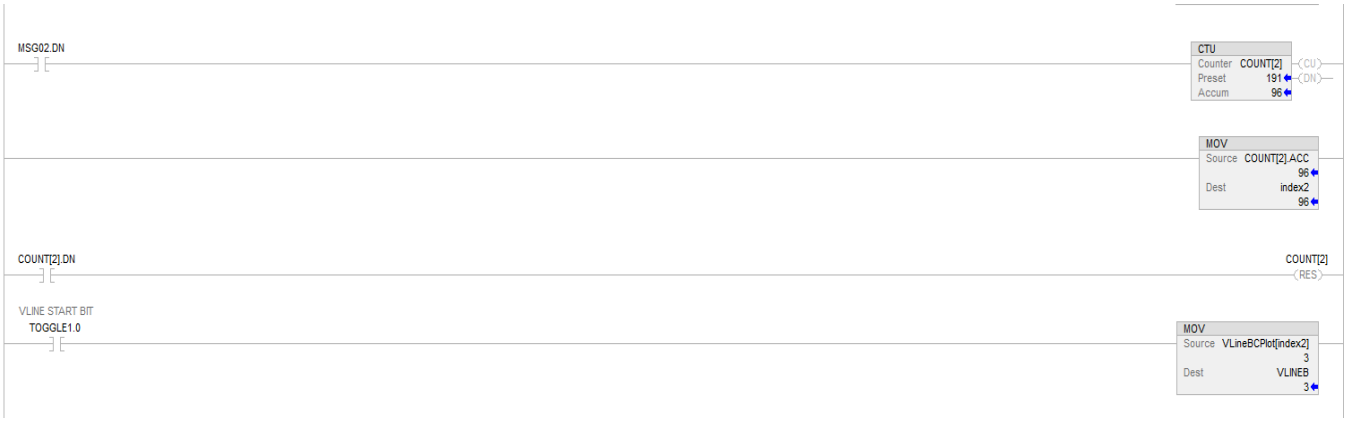


Figure 54: Sample Ladder Logic for VLineBCPlot

EtherNet/IP EDS File and Conformance Info

The EDS file for the EtherNet/IP communication interface can be read from the PQconnect board or is available from the TCI website (EtherNet/IP EDS File) or available via TCI technical support (direct dial 414-357-4541, email tech-support@transcoil.com)

For a description of the input and output data available over the EtherNet/IP interface, reference the EtherNet/IP Register Map in this user manual.

EtherNet/IP ODVA Declaration of Conformance Information can be found on TCI website.
(ODVA Declaration of Conformance Pdf)

EtherNet/IP Register Map

All EtherNet/IP Parameters in the register map can be accessed via explicit controller messaging via a generic CIP message block in Rockwell Studio 5000. The class ID for all Parameters will be **0xA2** in hex with the Instance ID corresponding to the Register Map Instance ID value. Please note that the Register Map tables may not match the EDS file groups parameters and some parameters may only be kept in reservation for future use.

Status Register Map

This register map contains Filter and Line Status parameters used by the passive filter. Please reference the Filter Status Table in the IOM if needed.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 43: Status Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet/IP Name)	Instance ID	Description	Type	Default & Ranges	Notes
USER_STATE (UserState)	206	User State	R	Default:0	User State Parameter 00 = INIT_START 01 = INIT_DELAY 02 = INIT_E2_CHIP 03 = INIT_FLASH_TEST 04 = WRITE_FLASH_TEST 05 = SETUP_FLASH 06 = SETUP_NON_CAL_FLASH 07 = SAVE_CURRENT_VALUES 08 = STAMP_EE 09 = INIT_FROM_DEFAULTS 10 = INIT_FROM_FLASH 11 = EXECUTE_PARAM_FUNCTIONS 12 = PARAM_INIT_FINISH 13 = RESTORE_DEFAULTS 14 = RESTORE_NON_CAL_DEFAULT 15 = INIT_SAVE_CURRENT_VALUES 16 = REBOOT 17 = SETUP_UNIT_CAL_FLASH 18 = RESTORE_UNIT_CAL_DEFAULT 19 = UPDATE_EEPROM 20 = UNPROTECT_EEPROM 21 = PROTECT_EEPROM
CNT_CLOSED (CntClosed)	272	Filter tuned circuit contactor closed	R	Default:0	Indicates the status of the Filters tuned circuit contactor. 0 = Contactor Closed 1 = Contactor Open
SYS_POWER_ON (PowerOn)	273	Filter powered on	R	Default:0	Indicates if the filter has input power available 0 = Power Off 1 = Power On
SYS_STATUS_OK (StatusOK)	274	Filter status OK	R	Default:0	Indicates filters status 0 = Filter is operating 1 = Filter has indicated status warning
SYS_AT_CAPACITY (AtCapacity)	275	Filter at maximum capacity	R	Default:0	Indicates if the filter is running at its maximum current capacity 0 = Nominal 1 = At Capacity

STATUS_FILTER_A (FilterStatusActiveA)	279	Filter status detection active A bit mask	R	Default:0	**Reference Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_B (FilterStatusActiveB)	280	Filter status detection active B bit mask	R	Default:0	
STATUS_LINE (LineStatusActive)	281	Line status detection active bit mask	R	Default:0	**Reference Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_LOAD (LoadStatusActive)	282	Filter load status detection bit mask	R	Default:0	**Reference Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_A_ENABLE_RO (FilterStatusEnabledA)	283	Filter status A detection enable bit mask	R	Default:0	**Reference Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_B_ENABLE_RO (FilterStatusEnabledB)	284	Filter status B detection enable bit mask	R	Default:0	
STATUS_LINE_ENABLE_RO (LineStatusEnabled)	285	Line status detection enable bit mask	R	Default:0	**Reference Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
STATUS_FILTER_LOAD_ENABLE_RO (LoadStatusEnabled)	286	Filter load status detection enable bit mask	R	Default:0	**Reference Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
PARAM_STATE (ParamState)	287	Parameter state	R	Default:0	Indicates the present state of the parameter state machine. 00 = INIT_START 01 = INIT_DELAY 02 = INIT_E2_CHIP 03 = INIT_FLASH_TEST 04 = WRITE_FLASH_TEST 05 = SETUP_FLASH 06 = SETUP_NON_CAL_FLASH 07 = SAVE_CURRENT_VALUES 08 = STAMP_EE 09 = INIT_FROM_DEFAULTS 10 = INIT_FROM_FLASH 11 = EXECUTE_PARAM_FUNCTIONS 12 = PARAM_INIT_FINISH 13 = RESTORE_DEFAULTS 14 = RESTORE_NON_CAL_DEFAULTS 15 = INIT_SAVE_CURRENT_VALUES 16 = REBOOT 17 = SETUP_UNIT_CAL_FLASH 18 = RESTORE_UNIT_CAL_DEFAULTS 19 = UPDATE_EEPROM 20 = UNPROTECT_EEPROM 21 = PROTECT_EEPROM

SYS_STATE (SysState)	288	System state	R	Default:0	Indicates the present state of the system state machine (Read Only) 00 = Initialization State Machine 01 = Initialization Parameters 02 = Power on Delay 03 = Unit State Configuration Check 04 = Reset 05 = Force Open Contactor 06 = Force Close Contactor 07 = Auto Load Open 08 = Auto Load Close 09 = Auto kVAR Close 10 = Auto kVAR Open 11 = External Open 12 = External Close 13 = No Contactor 14 = Contactor Closed Inhibited 15 = Calibrate offsets 16 = Calibrate Magnitude 17 = No Communication 18 = Communication configuration 19 = PCB Calibration Check 20 = Unit Calibration Check 21 = Pre-Calibration Check 22 = Unit in Contactor Debug Close
CNT_STATUS (CntStatus)	289	Contactor command status	R	Default:0	Indicates the present contactor status command, 00 = Init State at Startup 01 = Force Close Condition 02 = Force Open Condition 03 = Auto Load Open Condition 04 = Auto kVAR Open Condition 05 = External Open Condition 06 = No Contactor Condition 07 = Contactor Open 08 = Contactor Param Inhibit 09 = Contactor Power On Inhibit 10 = Contactor Calibrate Inhibit 11 = Contactor Min Reclose 12 = Contactor Close Delay 13 = Contactor Auto Reclose Delay 14 = Contactor Auto Reclose Limit 15 = Contactor Config Inhibit
RELAY_INPUT_STATUS (RelayInputStatus)	290	Digital relay input status	R	Default:0	Filter Relay Input Status, 0b00 = Relay 1 (Temp Okay), Relay 2 (Temp Okay) 0b01 = Relay 1 (Temp Hot), Relay 2 (Temp Okay) 0b10 = Relay 1 (Temp Okay), Relay 2 (Temp Hot) 0b11 = Relay 1 (Temp Hot), Relay 2 (Temp Hot)
FIELDBUS_STATUS_A (FBStatusA)	294	Field Bus communication status A Register	R	Default:0	Ethernet Module Status Register A Notifies the User of the status of the EtherNet/IP Module.
FIELDBUS_STATUS_B (FBStatusB)	295	Field Bus communication status B Register	R	Default:0	Ethernet Module Status Register B Notifies the User of the status of the EtherNet/IP Module.
SYS_NULL_STAT (PCBCalStatus)	296	Factory PCB calibration status	R	Default:0	System PCB Calibration Status 0 = Not Calibrated 1 = PCB Calibrated (Completed by Factory)

SYS_MAG_CAL_STATUS (UnitCalStatus)	300	Unit calibration completed status	R	Default:0	Six-bit bitmask of Calibration Status of Current Channels 0b000001 = channel 1 cal complete 0b000011 = channel 1 and 2 cal complete 0b111111 = channel 1 to 6 cal complete
HISTORY_LOG_STATUS (HistoryLogStatus)	312	History Log Status Value	R	Default:0	Indicates Status of the History Log 0 = Initializing History Log 1 = Successfully Reading History 2 = Out of Bounds history register 3 = EEPROM is busy
STATUS_FILTER_A_RELAY_ACTION (FilterStatusRelayAEn)	15	Filter status A relay action enable bit mask	R/W	Default:9 Range:0 to 65535	**Reference Filter Status Table** To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the relay will be activated. 0 = Disabled 65535 = All enabled
STATUS_FILTER_B_RELAY_ACTION (FilterStatusRelayBEn)	16	Filter status B relay action enable bit mask	R/W	Default:49151 Range:0 to 65535	
STATUS_LINE_RELAY_ACTION (LineStatusRelayEn)	17	Line status relay action enable bit mask	R/W	Default:71 Range:0 to 65535	**Reference Line Status Detection bits** To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the relay will be activated 0 = Disabled 65535 = All enabled
STATUS_FILTER_LOAD_RELAY_ACTION (LoadStatusRelayEn)	18	Filter load status relay action enable bit mask	R/W	Default:63 Range:0 to 65535	**Reference load status detection bits table** To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the relay will be activated. 0 = Disabled 65535 = All enabled
STATUS_FILTER_A_CNT_ACTION (FilterStatusCntAEn)	19	Filter status A tune contactor action enable bit mask	R/W	Default:1 Range:0 to 65535	**Reference Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal. 0 = Disabled 65535 = All enabled
STATUS_FILTER_B_CNT_ACTION (FilterStatusCntBEn)	20	Filter status B tune contactor action enable bit mask	R/W	Default:36863 Range:0 to 65535	
STATUS_LINE_CNT_ACTION (LineStatusCntEn)	21	Line status tune contactor action enable bit mask	R/W	Default:64 Range:0 to 65535	**Reference Line Status Detection bits** To Enable desired status detections, enter bit mask from table by converting to decimal. If a status is active and the bit corresponding to that status in this mask is set, the relay will be activated 0 = Disabled 65535 = All enabled

STATUS_FILTER_LOAD_CNT_ACTION (LoadStatusCntEn)	22	Filter load status tune contactor action enable bit mask	R/W	Default:0 Range:0 to 65535	**Reference load Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal. 0 = Disabled 65535 = All enabled
HISTORY_LOG_REQUEST (HistReqCmd)	189	Status detection history record request command	R/W	Default:0	

Device Register Map

This register map contains the main Device parameters used to define the Filter software, Bluetooth, EtherNet/IP, and Input parameters. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 44: Device Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
DSP_SW_VER (DSPFwVer)	207	Digital Signal Processor DSP firmware version	R	Default:0	Software Revision Code for Processor Two 8bit ASCII characters 0x3243 = ASCII for "C2"
HMS_SW_VER (FBFirmwareVer)	209	Fieldbus communications processor firmware version	R	Default:0	EtherNet Module Model Number
BGM_SW_VER (WLFirmwareVer)	211	Wireless communications firmware version	R	Default:0	Software Revision Code for Bluetooth Processor Two 8bit ASCII characters 0x4234 = ASCII for "4B"
PRODUCT_LINE_NUM (ProdLineNum)	213	Product line identification number	R	Default:0	**EtherNet/IP Only: Reserved** **Does not exist in Database**
PRODUCT_TYPE_NUM (ProdTypeNum)	214	Product type identification number	R	Default:0	**EtherNet/IP Only: Reserved** **Does not exist in Database**
LINE_VOLTAGE (GridVoltage)	215	Configured utility grid voltage.	R	Default:0	Filter Input Voltage 4800 = 480.0
LINE_FREQ (GridFrequency)	216	Utility grid frequency	R	Default:0	Filter Input Frequency 500 = 50.0
LINE_ROT (GridRotation)	217	Utility grid phase rotation	R	Default:0	Filter Input Phase Orientation 1 = ABC Rotation Expected 2 = ACB Rotation Expected
LINE_LOCK (GridSyncLocked)	218	Utility grid synchronization locked	R	Default:0	Filter Utility Grid Synchronous Locked (PLL) 0 = Not Locked 1 = Locked
CURRENT_WAVEFORM_ DATA_FORMAT (WaveformFormat)	7	Waveform data format	R/W	Default:0 Range:0 to 1	Changes the scaling of the waveforms displayed on PQvision 0 = A / 10 1 = Per Unit
RATED_CURRENT (RatedCurrent)	10	Unit rated current	R/W	Default:2500 Range:30 to 15000	Filter rated Current. 10 = 1.0 Amps Range: 3 to 1500 Arms
RATED_VOLTAGE (RatedVoltage)	11	Unit rated voltage	R/W	Default:4800 Range:1200 to 6900	Filter Rated Voltage 10 = 1.0 Volts Range: 120 to 690 Vrms

RATED_FREQUENCY (RatedFreq)			R/W	Default:60 Range:50 to 60	Filter Rated Frequency
RELAY_INPUT_1_CONFIG (Relay1Config)	40	12	Unit rated utility grid frequency, (Hz)	Default:0 Range:0 to 4	Customer External Control Input 1: J7 of the PCB 0 = Disabled 1 = Tuning Reactor Thermal Switch Input 2 = Line Reactor Thermal Switch Input 3 = Reset Command 4 = External Control Input
RELAY_INPUT_2_CONFIG (Relay2Config)	41	Relay input 2 configuration	R/W	Default:0 Range:0 to 4	Customer External Control Input 2: J8 of the PCB 0 = Disabled 1 = Tuning Reactor Thermal Switch Input 2 = Line Reactor Thermal Switch Input 3 = Reset Command 4 = External Control Input
STATUS_REACTOR_ SWITCH_DELAY (RelayInDelay)	42	Relay input/reactor thermal switch delay time, (sec)	R/W	Default:0 Range:0 to 0	**EtherNet/IP Only: Reserved** **Does not exist in Database**
SYS_SERIAL_NUM_2 (UnitSerialNum2)	160	Upper 16 bits of job number of the unit serial number	R/W	Default:0 Range:0 to 65535	Unit serial number section - upper 16 bits of 32-bit unit job number Parameter contains UUUU in the UUUULLLL-NN serial number format.
SYS_SERIAL_NUM_1 (UnitSerialNum1)	161	Lower 16 bits of job number of the unit serial number	R/W	Default:0 Range:0 to 65535	Unit serial number section - lower 16 bits of 32-bit unit job number Parameter contains LLLL in the UUUULLLL-NN serial number format.
SYS_SERIAL_NUM_0 (UnitSerialNum0)	162	Line number of the unit serial number	R/W	Default:0 Range:0 to 65535	Unit serial number section - two-digit unit number Parameter contains NN in the UUUULLLL- NN serial number format.
PCB_SERIAL_NUM_1 (PCBSerialNum1)	163	Upper 16 bits of the PCB serial number	R/W	Default:0 Range:0 to 65535	PCB serial number section Upper 16 bits of 32-bit unit job number Parameter contains UUUU in the UUUULLLL-NNN serial number format.
PCB_SERIAL_NUM_0 (PCBSerialNum0)	164	Lower 16 bits of the PCB serial number	R/W	Default:0 Range:0 to 65535	PCB serial number section Lower 16 bits of 32-bit unit job number Parameter contains LLLL in the UUUULLLL-NNN serial number format.
PCB_TEST_NUM (PCBTestNum)	165	Test number of the PCB serial number	R/W	Default:0 Range:0 to 65535	PCB serial number section three-digit unit number Parameter contains NNN in the UUUULLLL- NNN serial number format.
RATED_STEP_1_CAP (RatedStepCap1)	181	Unit rated capacitance for tune step 1	R/W	Default:575 Range:0 to 20000	Filter rated (step 1) capacitance Used for tune circuit no load current. 10 = 0.1uFarad

RATED_STEP_2_CAP (RatedStepCap2)	182	Unit rated capacitance for tune step 2	R/W	Default:0 Range:0 to 20000	Filter rated (step 2) capacitance. Used for tune circuit no load current. 10 = 0.1uFarad Only for filters with dual tuned circuits
RATED_CAP_CONFIG (RatedCapConfig)	183	Unit rated capacitance configuration	R/W	Default:0 Range:0 to 1	Filter rated capacitance configuration Used for tune circuit no load current 0 = Delta 1 = Wye

Control Register Map

This register map contains parameters which are used to control the Harmonic Guard filter. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use and are enabled in EtherNet/IP EDS File.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 45: Control Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
T_AMBIENT (TControl)	276	Filter controls temperature	R	Default:0 Range: -75C to 75C	Board will give a status condition of overtempt if it exceeds 75C or under-temp if the temperature descends past -40C. 10 = 1.0 deg C Range: -75C to 75C
SYS_INIT_COMPLETE (InitCmpl)	277	Controls start up init and calibration check complete	R	Default:0	**EtherNet/IP Only: Reserved Does not exist in Database**
CAP_DEGREDATION_WARNING (CapWrn)	278	Filter capacitor degradation warning	R	Default:0	**EtherNet/IP Only: Reserved Does not exist in Database**
SYS_DS_MODE (DSMode)	291	Data simulation mode active	R	Default:0	Indicates if the Processor is in data simulation mode 0 = Not in Data Sim Mode 1 = Data Sim Mode

CONFIG_MODE_ACTIVE (ConfigModeActive)	292	Active feedback sensing configuration mode	R	Default:0	Indicates PQconnect board current sensing mode. 0 = Config Sensing Mode Null 1 = Config Sensing Mode is Auto Selecting 2 = Config Sensing Mode is ABC (Uses all 3 phases for sensing, 8 op-amp configuration) 3 = Config Sensing Mode is AC (Uses Phase A and C for sensing, uses 6 op-amp configuration)
SYS_NULL_TMR (PCBCalTimer)	297	Factory PCB calibration timer value	R	Default:0	System null timer - Indicates whether the unit is calibrating. In units of 10s of milliseconds (600 = 6 seconds)
SYS_USAGE_MIN (CtrlCycMin)	301	Controls processor minimum cycle time usage, (10 = 1.0%)	R	Default:0	
SYS_USAGE_MAX (CtrlCycMax)	302	Processor Max Cycle Usage, (10 = 1.0%)	R	Default:0	
SYS_USAGE_AVG (CtrlCycAvg)	303	Processor Avg Cycle Usage, (10 = 1.0%)	R	Default:0	
PARAM_USER_CMD_REQ (ParamCmd)	1	Parameter save/load command	R/W	Default:1 Range:0 to 300	**Note** that defaulting the flash will clear all calibration data and require that the calibration procedure be re-run. 0 = Init State 1 = Stop Update 9 = Save Curnt. Values to Flash 21 = Set User Access 25 = Set Tech Access 30 = Set Factory Access 42 = Reboot/Reset PQconnect 100 = Clear History Log 150 = Load Values from Flash 200 = Restore Defaults to Flash 255 = Erase All Calibration Data 300 = Erase Unit Calibration Data
TRACE_GO_DONE (WaveformTrigCmd)	2	Waveform capture trigger command	R/W	Default:0 Range:0 to 1	Indicates whether waveform data is being captured 0 = Capture Done 1 = Start Capture
SYS_RESET (ResetCmd)	3	Contactor reset command	R/W	Default:0 Range:0 to 1	Reset contactor 0 = No Command 1 = Reset Contactor Closed

SYS_CONTROL_MODE (ControlMode)	8	Contactor control mode	R/W	Default:2 Range:0 to 6	Contactor Control Mode Allows the user to keep the contactor always off/on, auto turn on/off based on desired load percentage or kVAR, external relay input, in debug close mode. 0 = Always Open 1 = Always Closed 2= Auto load 3 = Auto kVAR 4 = External Control Input 5 = No contactor 6 = Diagnostic Always Close
SYS_AUTO_CONTACTOR_CLOSE (AutoCloseEn)	9	Enable contactor auto to reclose	R/W	Default:0 Range:0 to 1	Contactor auto reclose, this will attempt to reclose the contactor after it has been open through a status condition 0 = Disable 1 = Enable
CNT_CLOSE_LOAD_THRESHOLD (CntCloseLoadThrsh)	23	Contactor close threshold in load control mode	R/W	Default:30 Range:10 to 100	Contactor close threshold in percent rated current* % rated current
CNT_CLOSE_LOAD_HYSTERESIS (CntCloseLoadHys)	24	Contactor close/open hysteresis in load control mode	R/W	Default:5 Range:2 to 50	Contactor will open when it reaches the hysteresis * % rated current
CNT_CLOSE_DELAY (CntCloseDelay)	27	Contactor close delay time	R/W	Default:5 Range:1 to 3600	second
CNT_OPEN_DELAY (CntOpenDelay)	28	Contactor open delay time	R/W	Default:5 Range:1 to 3600	second
CNT_AUTO_RECLOSE_DELAY (CntAutoReCloseDelay)	31	Contactor auto re-close delay time	R/W	Default:300 Range:120 to 65535	second
CNT_POWER_ON_DELAY (PowerOnDelay)	32	System power on start delay time	R/W	Default:0 Range:0 to 65535	
CNT_AUTO_RECLOSE_ATTEMPTS (CntAutoReCloseNum)	33	Contactor auto re-close max number attempts allowed	R/W	Default:5 Range:1 to 15	Maximum number of contactors auto re-close attempts allowed
CNT_AUTO_RECLOSE_TIMESPAN (CntAutoReCloseTime)	34	Contactor auto re-close max attempt time span, (sec)	R/W	Default:600 Range:300 to 65535	Maximum number of contactors auto re-close attempts time span
BOOTLOADER_START (BootCmd)	39	Bootloader command	R/W	Default:0 Range:0 to 2	Used to navigate to bootloader, which launches the main program 0 = No Action 1 = Start Bootloader 2 = Start Recovery
SYS_MAG_CAL_ENABLE (UnitCalEn)	78	System magnitude Calibration	R/W	Default:0 Range:0 to 1	System Magnitude Calibration 0 = Disable 1 = Enable

SYS_CNT_MIN_OFF_TIME (CntMinOffTime)	113	Contactor minimum open time, (sec)	R/W	Default:60 Range:10 to 300	
SYS_NULL_EN (PCBCalEn)	119	Factory PCB calibration enable	R/W	Default:0 Range:0 to 1	PCB Calibration 0 = Disable 1 = Enable
SYS_CPU_THRESHOLD (CtrlFaultOnset)	159	Controls Processor fault threshold	R/W	Default:12369 Range:0 to 17361	
FIELD_BUS_COMMAND (FBCmd)	180	Field Bus communication module command input	R/W	Default:0 Range:0 to 255	Field Bus Command Input 0 = No Command 3 = Reset 5 = Shutdown
CT_ENABLE (CTEn)	184	Current transformer CT feedback enable	R/W	Default:0 Range:0 to 1	Only used for filters with dual tuned circuits 0 = Disabled 1 = Enabled
CONFIG_MODE (SensingFdbkMode)	187	Feedback sensing configuration mode selection	R/W	Default:1 Range:1 to 3	
FAULT_PHASE_ROTATION (PhaseRotationDetect)	74	Phase rotation status setpoint	R/W	Default:1 Range:0 to 2	Filter expected input phase orientation 0 = Undef 1 = Forward 2 = Reverse
STATUS_CPU_ERROR_DELAY (CtrlFaultDelay)	157	Controls Processor fault delay time, (Sec)	R/W	Default:0	**EtherNet/IP Only: Reserved Does not exist in Database**
HISTORY_LOG_REQUEST (HistReqCmd)	189	Status detection history record request command	R/W	Default:0 Range:0 to 0	

Communication Register Map

This register map contains parameters which are used to communicate back and forth with the Harmonic Filter. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use and are enabled in EtherNet/IP EDS File.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 46: Communication Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
BGM_MODULE_STATUS (WLStatus)	293	Wireless pairing status	R	Default:0	Status of the BGM (Bluetooth LE module) 0 = Idle 1 = Advertising 2 = Connected 3 = Not Responding 4 = Radio Disabled 5 = Firmware Mismatch
SYS_INT_HB (IntHeartbeat)	298	System interrupt heartbeat counter	R	Default:0 Range:0 to 65535	Processor Internal Heartbeat Counter Counts and rolls over to zero used to verify Processor Clock.
SYS_BG_HB (BGHeartbeat)	299	System background heartbeat counter	R	Default:0 Range:0 to 65535	Processor background heartbeat Counter Counts and rolls over to zero used to verify processor clock operation
PARAM_KEY_A (ParamKeyA)	4	Parameter access key value A	R/W	Default:0 Range:0 to 65535	Parameter Key Register A User can write the required parameter access key to this parameter and Parameter Key Register B To set the PQconnect board in a different access level.
PARAM_KEY_B (ParamKeyB)	5	Parameter access key value B	R/W	Default:0 Range:0 to 65535	Parameter Key Register B User can write the required parameter access key to this parameter and Parameter Key Register A To set the PQconnect board in a different access level.
MB_SLAVE_ADDRESS (ModbusDeviceID)	35	Modbus device server address	R/W	Default:10 Range:1 to 247	Modbus Slave Address
MB_BAUD_RATE (ModbusBaud)	36	Modbus device baud rate, (bits per second)	R/W	Default:11520 Range:0 to 11520	Modbus Baud Rate 11520 = 115200 baud rate 960 = 9600 baud rate 3840 = 38400 baud rate
MB_PARITY (ModbusParity)	37	Modbus device parity	R/W	Default:2 Range:0 to 2	0 = None 1 = Odd 2 = Even

MB_SAVE_SET_FLAG (ModbusSaveFlag)	38	Modbus RTU save new settings	R/W	Default:0 Range:0 to 2	Modbus Flag Save Settings 0 = Not Saving Settings 1 = Saving Settings"
BLUETOOTH_ENABLE (BTEn)	158	Bluetooth radio enable	R/W	Default:1 Range:0 to 1	Set to Enable BGM 1 = Enabled 0 = Disabled
BGM_STATIC_PASSKEY_A (WLPasskeyA)	174	Upper 16 bits of wireless password	R/W	Default:1 Range:0 to 15	
BGM_STATIC_PASSKEY_B (WLPasskeyB)	175	Lower 16 bits of wireless password	R/W	Default:45575 Range:0 to 65535	
BGM_SECUIRTY_LEVEL (WLSecurityLevel)	176	Wireless security level	R/W	Default:0 Range:0 to 1	BGM Security level. High Security mode blocks new pairing requests. Passkey changes each time a connection is attempted. 0 = Low Security 1 = High Security
BGM_NUMERIC_ID (WLNumericID)	177	Wireless numeric identifier	R/W	Default:0 Range:0 to 99	
BGM_PAIRING_MODE (WLPairingMode)	178	Wireless pairing mode request	R/W	Default:0 Range:0 to 1	0 = No active request 1 = Active request
BGM_COMMAND (WLCmd)	179	Wireless command input	R/W	Default:0 Range:0 to 255	
POWER_CYC_COUNT (PwrCycCount)	188	Running number of powers on-off cycles	R/W	Default:0 Range:0 to 0	

Power Register Map

This register map contains parameters that are used to store and calculate the power output and input of the harmonic filter. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use and are enabled in EtherNet/IP EDS File.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 47: Power Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
P_LINE_APPARENT_TOTAL (SLine)	258	Line apparent power, (kVA)	R	Default:0 Range: 0 to 1000 kVAR	Total Filter input apparent power.
P_LINE_REAL_TOTAL (PLine)	259	Line real power, (kW)	R	Default:0 Range: 0 to 1000 kVAR	Total Filter input real power.
P_LINE_REACTIVE_TOTAL (QLine)	260	Line reactive power, (kVAR)	R	Default:0 Range: 0 to 1000 kVAR	Total Filter input reactive power: Negative number indicates inductive power; Positive number indicates capacitive power.

P_LINE_POWER_FACTOR (PFLine)	261	Line power factor, (%)	R	Default:0 Range: -1000 to 1000	Filter input Displacement Power Factor – Negative value indicates lagging power factor. 1,000 = 1.00 Unity PF -950 = 0.95 Lagging PF 950 = 0.95 Leading PF
P_LOAD_APPARENT_TOTAL (SLoad)	262	Load apparent power, (kVA)	R	Default:0 Range: 0 to 1000 kVAR	Total Filter output apparent power
P_LOAD_REAL_TOTAL (PLoad)	263	Load real power, (kW)	R	Default:0 Range: 0 to 1000 kVAR	Total Filter output real power
P_LOAD_REACTIVE_TOTAL (QLoad)	264	Load reactive power, (kVAR)	R	Default:0 Range: -1000 to 1000 kVAR	Total Filter output reactive power: Negative number indicates inductive power. Positive number indicates capacitive power
P_LOAD_POWER_FACTOR (PFLoad)	265	Load power factor, (%)	R	Default:0 Range: -1000 to 1000	Filter output Displacement Power Factor – Negative values indicate lagging power factor. 1,000 = 1.00 Unity PF -950 = 0.95 Lagging PF 950 = 0.95 Leading PF
P_LOAD_REAL_MEAS (PLoadAlt)	266	Measured Load real power, (kW)	R	Default:0	
NO_LOAD_CAP_CURRENT (ITuneNoLoad)	308	Unit rated capacitance no load cap current, (Farads)	R	Default:0 Range: 0 to 65535	Expected tune circuit current at no load in tenths of amps.
KVAR_EFFECTIVE (KVAREffective)	309	Effective kVAR after applying kVAR factor, (kVAR)	R	Default:0	Effective nameplate kVAR after kVAR factor. Used for kVAR contactor control 10 = 10KVAR Range: -32768 to 32767
PF_KVAR_SLOPE (KVARSlope)	310	Slope factor applied to nameplate kVAR for kVAR contactor control.	R	Default:0	Slope factor applied to nameplate kVAR for kVAR contactor control. Range: -32768 to 32767
PF_KVAR_INTERCEPT (KVARIntercept)	311	Intercept factor applied to nameplate kVAR for kVAR contactor control., (kVAR)	R	Default:0 Range: 0 to 65535	Intercept factor applied to nameplate kVAR for kVAR contactor control.
CNT_CLOSE_KVAR_THRESHOLD (CntCloseKVARThrsh)	25	Contactor close threshold for kVAR control mode, (kVAR)	R/W	Default:50 Range:0 to 1000	Contactor close threshold for kVAR control negative setpoint = lagging target positive setpoint = leading target
CNT_CLOSE_KVAR_HYSTERESIS (CntCloseKVARHys)	26	Contactor close/open hysteresis in kVAR control mode, (%)	R/W	Default:10 Range:5 to 100	Contactor will open when it reaches the hysteresis

SYS_PF_STEP_1_KVAR (TuneKVAR1)	29	Tune circuit 1, (kVAR)	R/W	Default:5 Range:0 to 500	Desired filter kVAR for contactor to enable
SYS_PF_STEP_2_KVAR (TuneKVAR2)	30	Tune circuit 2, (kVAR)	R/W	Default:5 Range:0 to 500	Filter Second Tuned Circuit kVAR (Only used for filters with dual tuned circuits)
PF_KVAR_FACTOR_NL (KVARFactorNL)	185	Factor applied to nameplate kVAR at no load for kVAR contactor control	R/W	Default:105 Range:100 to 140	100 = 1.0
PF_KVAR_FACTOR_FL (KVARFactorFL)	186	Factor applied to nameplate kVAR at full load for kVAR contactor control	R/W	Default:115 Range:100 to 140	100 = 1.0

Voltage Register Map

This register map contains parameters that are used to Line and Tune Voltages in RMS, the voltage in these parameters described by a factor of 10, meaning that a value of 10 indicates 1.0 Vrms. Note that some parameters shown below may not exist in the parameter database/ or shown in PQvision. These parameters have been reserved for future use and are enabled in EtherNet/IP EDS File.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 48: Voltage Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
V_LINE_AB_RMS (VLineABRMS)	219	Line voltage phase AB RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	Source Utility Line Phase to Phase Voltage (A-B)
V_LINE_BC_RMS (VLineBCRMS)	220	Line voltage phase BC RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	Source Utility Line Phase to Phase Voltage (B-C)
V_LINE_CA_RMS (VLineCARMS)	221	Line voltage phase CA RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	Source Utility Line Phase to Phase Voltage (C-A)
V_LOAD_AB_RMS (VLoadABRMS)	234	Load voltage phase AB RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	Filter Output Phase to Phase Voltage (A-B)
V_LOAD_BC_RMS (VLoadBCRMS)	235	Load voltage phase BC RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	Filter Output Phase to Phase Voltage (B-C)
V_LOAD_CA_RMS (VLoadCARMS)	236	Load voltage phase CA RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	Filter Output Phase to Phase Voltage (C-A)
V_TUNE_A_RMS (VTuneABRMS)	246	Tuned circuit voltage phase AB RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	
V_TUNE_B_RMS (VTuneBCRMS)	247	Tuned circuit voltage phase BC RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	
V_TUNE_C_RMS (VTuneCARMS)	248	Tuned circuit voltage phase CA RMS, (10 = 1.0 Volts)	R	Default:0 Range: 0 to 1000 Vrms	

THVD Register Map

This register map contains parameters that are used to Line and Tune Total Harmonic Voltage Distortion percentages, the THVD percentages are described by a factor of 10, meaning that a value of 10 indicates 1.0 %.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 49: THVD Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
V_LINE_AB_THD (VLineABTHD)	222	Line voltage phase AB THD	R	Default:0	10 = 1.0%
V_LINE_BC_THD (VLineBCTHD)	223	Line voltage phase BC THD	R	Default:0	10 = 1.0%
V_LINE_CA_THD (VLineCATHD)	224	Line voltage phase CA THD	R	Default:0	10 = 1.0%
V_LOAD_AB_THD (VLoadABTHD)	237	Load voltage phase AB THD	R	Default:0	10 = 1.0%
V_LOAD_BC_THD (VLoadBCTHD)	238	Load voltage phase BC THD	R	Default:0	10 = 1.0%
V_LOAD_CA_THD (VLoadCATHD)	239	Load voltage phase CA THD	R	Default:0	10 = 1.0%
V_TUNE_A_THD (VTuneABTHD)	249	Tuned circuit voltage phase AB THD	R	Default:0	10 = 1.0%
V_TUNE_B_THD (VTuneBCTHD)	250	Tuned circuit voltage phase BC THD	R	Default:0	10 = 1.0%
V_TUNE_C_THD (VTuneCATHD)	251	Tuned circuit voltage phase CA THD	R	Default:0	10 = 1.0%
FAULT_HIGH_THD_ONSET (VLineHighTHDOnset)	71	Voltage THD high onset threshold	R/W	Default:120 Range:20 to 200	Percent rated voltage
FAULT_HIGH_THD_CLEAR (VLineHighTHDClear)	72	Voltage THD high clear threshold	R/W	Default:110 Range:20 to 200	Percent rated voltage)
FAULT_HIGH_THD_DELAY (VLineHighTHDDelay)	73	Voltage THD high delay time,	R/W	Default:20 Range:1 to 3600	seconds
STATUS_HIGH_THD_WARNING_ ONSET (VLineHighTHDWrnOnset)	75	Voltage THD high warning onset threshold, (Percent)	R/W	Default:0 Range:0 to 0	**EtherNet/IP Only: Reserved Does not exist in Database**
STATUS_HIGH_THD_WARNING_ CLEAR (VLineHighTHDWrnClear)	76	Voltage THD high warning clear threshold, (Percent)	R/W	Default:0 Range:0 to 0	
STATUS_HIGH_THD_WARNING_ DELAY (VLineHighTHDWrnDelay)	77	Voltage THD high warning delay time, (sec)	R/W	Default:0 Range:0 to 0	
V_THD_SCALAR (VTHDScalar)	115	Voltage THD gain adjustment factor	R/W	Default:16384 Range: -32768 to 32767	Value set by Factory

Current Register Map

This register map contains parameters that are used to Line and Tune Currents in Amps RMS. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use and are enabled in EtherNet/IP EDS File.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 50: Current Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
I_LINE_A_RMS (ILineARMS)	225	Line current phase A RMS, (10 = 1.0 Amps)	R	Default:0	Filter Input Current Phase A Range: 0 to 1000 Arms
I_LINE_B_RMS (ILineBRMS)	226	Line current phase B RMS, (10 = 1.0 Amps)	R	Default:0	Filter Input Current Phase B Range: 0 to 1000 Arms
I_LINE_C_RMS (ILIneCRMS)	227	Line current phase C RMS, (10 = 1.0 Amps)	R	Default:0	Filter Input Current Phase C Range: 0 to 1000 Arms
I_LOAD_A_RMS (ILoadARMS)	240	Load current phase A RMS, (10 = 1.0 Amps)	R	Default:0	Range: 0 to 1000 Arms
I_LOAD_B_RMS (ILoadBRMS)	241	Load current phase B RMS, (10 = 1.0 Amps)	R	Default:0	
I_LOAD_C_RMS (ILoadCRMS)	242	Load current phase C RMS, (10 = 1.0 Amps)	R	Default:0	
I_TUNE_A_RMS (ITuneARMS)	252	Tuned circuit current phase A RMS, (10 = 1.0 Amps)	R	Default:0	
I_TUNE_B_RMS (ITuneBRMS)	253	Tuned circuit current phase B RMS, (10 = 1.0 Amps)	R	Default:0	
I_TUNE_C_RMS (ITuneCRMS)	254	Tuned circuit current phase C RMS, (10 = 1.0 Amps)	R	Default:0	

THID Register Map

This register map contains parameters that are used to Line and Tune Currents in Total Harmonic Current Distortion percentages, the THID percentages are described by a factor of 10, meaning that a value of 10 indicates 1.0 %.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 51: THID Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
I_LINE_A_THD (ILineATHD)	228	Line current phase A THD, (10 = 1.0%)	R	Default:0	
I_LINE_B_THD (ILineBTHD)	229	Line current phase B THD, (10 = 1.0%)	R	Default:0	
I_LINE_C_THD (ILineCTHD)	230	Line current phase C THD, (10 = 1.0%)	R	Default:0	
I_LOAD_A_THD (ILoadATHD)	243	Load current phase A THD, (10 = 1.0%)	R	Default:0	

I_LOAD_B_THD (ILoadBTHD)	244	Load current phase B THD, (10 = 1.0%)	R	Default:0	
I_LOAD_C_THD (ILoadCTHD)	245	Load current phase C THD, (10 = 1.0%)	R	Default:0	
I_TUNE_A_THD (ITuneATHD)	255	Tuned circuit current phase A THD, (10 = 1.0%)	R	Default:0	
I_TUNE_B_THD (ITuneBTHD)	256	Tuned circuit current phase B THD, (10 = 1.0%)	R	Default:0	
I_TUNE_C_THD (ITuneCTHD)	257	Tuned circuit current phase C THD, (10 = 1.0%)	R	Default:0	
I_THD_SCALAR (ITHDScalar)	116	Current THD gain adjustment factor	R/W	Default:16384 Range: -32768 to 32767	Value set by Factory

TDD Register Map

This register map contains parameters that are used to Line and Tune Currents in Total Harmonic Current Distortion percentages, the THID percentages are described by a factor of 10, meaning that a value of 10 indicates 1.0 %.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 52: TDD Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
I_LINE_A_TDD (ILineATHD)	228	Filter input total Demand Distortion Phase A iTDD, (10 = 1.0%)	R	Default:0	
I_LINE_B_TDD (ILineBTDD)	229	Filter input total Demand Distortion Phase B iTDD, (10 = 1.0%)	R	Default:0	
I_LINE_C_TDD (ILineCTDD)	230	Filter input total Demand Distortion Phase C iTDD, (10 = 1.0%)	R	Default:0	

Scalar Register Map

This register map contains the Scalar parameters used during PCB and Unit Calibration of the filter. Many of the values are set by TCI, LLC and should not be changed unless suggested by an TCI, Application Engineer. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Parameters should not be changed manually by the user, doing so will alter the filter's performance and accuracy.

Table 53: Scalar Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet Name)	Instance ID	Description	Type	Default & Ranges	Notes
V_LOAD_AB_PEAK_RMS_RATIO (VLoadABRatio)	267	Load output peak voltage to RMS ratio phase AB, (Percent)	R	Default:0	**EtherNet/IP Only: Reserved Does not exist in Database.**
V_LOAD_BC_PEAK_RMS_RATIO (VLoadBCRatio)	268	Load output peak voltage to RMS ratio phase BC, (Percent)	R	Default:0	
V_LOAD_CA_PEAK_RMS_RATIO (VLoadCARatio)	269	Load output peak voltage to RMS ratio phase CA, (Percent)	R	Default:0	
CT_RATIO (CTRatio)	6	Current Transformer CT ratio primary Amps relative to five Amp secondary, (Amps)	R/W	Default:50 Range:5 to 10000	Dual Turned Circuit Current Transformer (CT) ratios Note: Only required for units with two tuned circuits XXXX:5 where XXXX is the primary turns count of the CT 100 = 1000:5 50 = 500: 5 Range 5 to 10000
I_LINE_EST_A_SCALAR (ILineEstAScalar)	86	Magnitude scalar for current calculation line phase A	R/W	Default:6000 Range:-32768 to 32767	Value set by Factory
I_LINE_EST_B_SCALAR (ILineEstBScalar)	87	Magnitude scalar for current calculation line phase B	R/W	Default:6000 Range:-32768 to 32767	
I_LINE_EST_C_SCALAR (ILineEstCScalar)	88	Magnitude scalar for current calculation line phase C	R/W	Default:6000 Range:-32768 to 32767	
I_TUNE_EST_A_SCALAR (ITuneEstAScalar)	89	Magnitude scalar for current calculation tune phase A	R/W	Default:4000 Range:-32768 to 32767	
I_TUNE_EST_B_SCALAR (ITuneEstBScalar)	90	Magnitude scalar for current calculation tune phase B	R/W	Default:4000 Range:-32768 to 32767	
I_TUNE_EST_C_SCALAR (ITuneEstCScalar)	91	Magnitude scalar for current calculation tune phase C	R/W	Default:4000 Range:-32768 to 32767	
V_LOAD_SCALAR_B (VLoadBScalar)	92	Magnitude scalar for load voltage phase BC	R/W	Default:0 Range:0 to 0	**EtherNet/IP Only: Reserved Does not exist in Database**
V_LINE_SCALAR_A (VLineAScalar)	93	Magnitude scalar for line voltage phase AB	R/W	Default:5982 Range: -32768 to 32767	Value set by Factory

V_LINE_SCALAR_B (VLineBScalar)	94	Magnitude scalar for line voltage phase BC	R/W	Default:5982 Range: -32768 to 32767	Value set by Factory
V_LINE_SCALAR_C (VLineCScalar)	95	Magnitude scalar for line voltage phase CA	R/W	Default:5982 Range: -32768 to 32767	
V_LOAD_SCALAR_A (VLoadAScalar)	96	Magnitude scalar for load voltage phase AB	R/W	Default:5982 Range:-32768 to 32767	
V_LOAD_SCALAR_C (VLoadCScalar)	97	Magnitude scalar for load voltage phase CA	R/W	Default:5982 Range:-32768 to 32767	
V_TUNE_SCALAR_A (VTuneAScalar)	98	Magnitude scalar for tune voltage phase AB	R/W	Default:5982 Range:-32768 to 32767	
V_TUNE_SCALAR_C (VTuneCScalar)	99	Magnitude scalar for tune voltage phase CA	R/W	Default:5982 Range:-32768 to 32767	
I_LINE_SCALAR_A (ILineAScalar)	100	Magnitude scalar for line current CT phase A	R/W	Default:1091 Range:-32768 to 32767	
I_LINE_SCALAR_C (ILineCScalar)	101	Magnitude scalar for line current CT phase C	R/W	Default:1091 Range:-32768 to 32767	
I_TUNE_SCALAR_A (ITuneAScalar)	102	Magnitude scalar for tune current CT phase A	R/W	Default:1091 Range:-32768 to 32767	
I_TUNE_SCALAR_C (ITuneCScalar)	103	Magnitude scalar for tune current CT phase A	R/W	Default:1091 Range:-32768 to 32767	
T_AMBIENT_SCALAR (TAmbientScalar)	104	Magnitude scalar for controls temperature	R/W	Default:12000 Range:-32768 to 32767	
V_LINE_RMS_SCALAR (VLineRMSScalar)	105	RMS calculation scalar for line voltage	R/W	Default:437 Range:-32768 to 32767	
V_LOAD_RMS_SCALAR (VLoadRMSScalar)	106	RMS calculation scalar for load voltage	R/W	Default:437 Range:-32768 to 32767	
I_LINE_RMS_SCALAR (ILineRMSScalar)	107	RMS calculation scalar for line current	R/W	Default:128 Range:-32768 to 32767	
I_LOAD_RMS_SCALAR (ILoadRMSScalar)	108	RMS calculation scalar for load current	R/W	Default:128 Range:-32768 to 32767	
STATUS_MIN_DETECTION_VOLTAGE (VLoadMinDetect)	109	Minimum voltage to enable status detections, (Percent in rated voltage)	R/W	Default:0 Range:0 to 0	**EtherNet/IP Only: Reserved Does not exist in Database.**
FUND_MIN_TRACKING_VOLTAGE (VLoadMinTrack)	110	Minimum voltage to enable output voltage frequency tracking, (percent rated voltage)	R/W	Default:0 Range:0 to 0	
I_TUNE_TAP_GAIN (ITuneTapGain)	114	Line reactor tap turn coupling gain	R/W	Default:1820 Range:-32768 to 32767	Value set by Factory
V_DIFF_LINE_B_SCALAR (VReactorLineScalarB)	140	Line reactor voltage scalar phase B	R/W	Default:16384 Range:-32768 to 32767	
V_DIFF_LINE_C_SCALAR (VReactorLineScalarC)	141	Line reactor voltage scalar phase C	R/W	Default:16384 Range:-32768 to 32767	
V_DIFF_TUNE_A_SCALAR (VReactorTuneScalarA)	142	Tune reactor voltage scalar phase A	R/W	Default:16384 Range:-32768 to 32767	
V_DIFF_TUNE_B_SCALAR (VReactorTuneScalarB)	143	Tune reactor voltage scalar phase B	R/W	Default:16384 Range:-32768 to 32767	
V_DIFF_TUNE_C_SCALAR (VReactorTuneScalarC)	144	Tune reactor voltage scalar phase C	R/W	Default:16384 Range:-32768 to 32767	

Calibration Reference Register Map

The Calibration Reference Register map contains parameters used by the PQconnect board for factory calibration of the PCB and the Users Unit. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Parameters should not be changed manually by the user, doing so will alter the filter's performance and accuracy.

Table 54: Calibration Reference Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet/IP Name)	Instance ID	Description	Type	Default & Ranges	Notes
SYS_I_LINE_CAL_A (ILineCalRefA)	79	Reference calibration current line phase A, (10 = 1.0A)	R/W	Default:0 Range:0 to 65535	Input current measured on A phase of the filter
SYS_I_LINE_CAL_B (ILineCalRefB)	80	Reference calibration current line phase B, (10 = 1.0A)	R/W	Default:0 Range:0 to 65535	Input current measured on B phase of the filter
SYS_I_LINE_CAL_C (ILineCalRefC)	81	Reference calibration current line phase C, (10 = 1.0A)	R/W	Default:0 Range:0 to 65535	Input current measured on C phase of the filter
SYS_I_TUNE_CAL_A (ITuneCalRefA)	82	Reference calibration current tune phase A, (10 = 1.0A)	R/W	Default:0 Range:0 to 65535	Tune circuit current measured on A phase of the filter
SYS_I_TUNE_CAL_B (ITuneCalRefB)	83	Reference calibration current tune phase B, (10 = 1.0A)	R/W	Default:0 Range:0 to 65535	Tune circuit current measured on B phase of the filter
SYS_I_TUNE_CAL_C (ITuneCalRefC)	84	Reference calibration current tune phase C, (10 = 1.0A)	R/W	Default:0 Range:0 to 65535	Tune circuit current measured on C phase of the filter
SYS_MAG_CAL_TOL (CalTolerance)	85	Current calculation magnitude calibration tolerance, (10 = 1.0A)	R/W	Default:5 Range:0 to 15000	System mag calibration Tolerance Value used by the PQconnect for setting the threshold for Calibrated reference currents. Pass/Fail range. 20 = 0.02 amps tolerance
I_LINE_EST_A_INT_DECAY (ILineEstDecayA)	145	Line current estimation decay phase A	R/W	Default:16375 Range:0 to 65535	Value set by Factory
I_LINE_EST_B_INT_DECAY (ILineEstDecayB)	146	Line current estimation decay phase B	R/W	Default:16375 Range:0 to 65535	
I_LINE_EST_C_INT_DECAY (ILineEstDecayC)	147	Line current estimation decay phase C	R/W	Default:16375 Range:0 to 65535	
I_TUNE_EST_A_INT_DECAY (ITuneEstDecayA)	148	Tune current estimation decay phase A	R/W	Default:16375 Range:0 to 65535	
I_TUNE_EST_B_INT_DECAY (ITuneEstDecayB)	149	Tune current estimation decay phase B	R/W	Default:16375 Range:0 to 65535	
I_TUNE_EST_C_INT_DECAY (ITuneEstDecayC)	150	Tune current estimation decay phase C	R/W	Default:16375 Range:0 to 65535	

I_LINE_EST_A_SIN_NULL (ILineEstCalA)	151	Line current estimation calibration sine phase A	R/W	Default:0 Range: -32768 to 32767	
I_LINE_EST_B_SIN_NULL (ILineEstCalB)	152	Line current estimation calibration sine phase B	R/W	Default:0 Range:-32768 to 32767	Value set by Factory
I_LINE_EST_C_SIN_NULL (ILineEstCalC)	153	Line current estimation calibration sine phase C	R/W	Default:0 Range:-32768 to 32767	Value set by Factory
I_TUNE_EST_A_SIN_NULL (ITuneEstCalA)	154	Tune current estimation calibration sine phase A	R/W	Default:0 Range:-32768 to 32767	Value set by Factory
I_TUNE_EST_B_SIN_NULL (ITuneEstCalB)	155	Tune current estimation calibration sine phase B	R/W	Default:0 Range:-32768 to 32767	Value set by Factory
I_TUNE_EST_C_SIN_NULL (ITuneEstCalC)	156	Tune current estimation calibration sine phase C	R/W	Default:0 Range:-32768 to 32767	Value set by Factory

Offset Register Map

The Offset Register map contains parameters used by the PQconnect board for factory calibration of the PCB and the Users Unit for offsetting any current, voltage, and temperature readings. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Parameters should not be changed manually by the user, doing so will alter the filter's performance and accuracy.

Table 55: Offset Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet/IP Name)	Instance ID	Description	Type	Default & Ranges	Notes
V_THD_OFFSET (VTHDOffset)	117	Voltage THD offset adjustment factor	R/W	Default:0 Range: -32768 to 32767	Value set by Factory
I_THD_OFFSET (ITHDOffset)	118	Current THD offset adjustment factor	R/W	Default:0 Range: -32768 to 32767	
V_LOAD_B_OFFSET (VLoadBOffset)	120	Load voltage offset phase B	R/W	Default:0 Range:0 to 0	**EtherNet Only: Reserved Does not exist in Database**
V_LINE_A_OFFSET (VLineAOffset)	121	Line voltage offset phase A	R/W	Default:2048 Range:0 to 4096	Value set by Factory
V_LINE_B_OFFSET (VLineBOffset)	122	Line voltage offset phase B	R/W	Default:2048 Range:0 to 4096	
V_LINE_C_OFFSET (VLineCOffset)	123	Line voltage offset phase C	R/W	Default:2048 Range:0 to 4096	
V_LOAD_A_OFFSET (VLoadAOffset)	124	Load voltage offset phase A	R/W	Default:2048 Range:0 to 4096	
V_LOAD_C_OFFSET (VLoadCOffset)	125	Load voltage offset phase C	R/W	Default:2048 Range:0 to 4096	
V_TUNE_A_OFFSET (VTuneAOffset)	126	Tune voltage offset phase A	R/W	Default:2048 Range:0 to 4096	
V_TUNE_C_OFFSET (VTuneCOffset)	127	Tune voltage offset phase C	R/W	Default:2048 Range:0 to 4096	

V_DIFF_LINE_A_OFFSET (VRctrLineAOffset)	128	Reactor Diff Voltage Offset Phase A	R/W	Default:2048 Range:0 to 4096	
V_DIFF_LINE_B_OFFSET (VRctrLineBOffset)	129	Reactor Diff Voltage Offset Phase B	R/W	Default:2048 Range:0 to 4096	
V_DIFF_LINE_C_OFFSET (VRctrLineCOffset)	130	Reactor Diff Voltage Offset Phase C	R/W	Default:2048 Range:0 to 4096	
V_DIFF_TUNE_A_OFFSET (VRctrTuneAOffset)	131	Reactor Diff Voltage Offset Phase A	R/W	Default:2048 Range:0 to 4096	
V_DIFF_TUNE_B_OFFSET (VRctrTuneBOffset)	132	Reactor Diff Voltage Offset Phase B	R/W	Default:2048 Range:0 to 4096	
V_DIFF_TUNE_C_OFFSET (VRctrTuneCOffset)	133	Reactor Diff Voltage Offset Phase C	R/W	Default:2048 Range:0 to 4096	
I_LINE_A_OFFSET (ILineAOffset)	134	Line Current Offset Phase A for CT Input	R/W	Default:2048 Range:0 to 8192	Value set by Factory
I_LINE_C_OFFSET (ILineCOffset)	135	Line Current Offset Phase A for CT Input	R/W	Default:2048 Range:0 to 8192	
I_LOAD_A_OFFSET (ILoadAOffset)	136	Load Current Offset Phase A for CT input	R/W	Default:2048 Range:0 to 8192	
I_LOAD_C_OFFSET (ILoadCOffset)	137	Load Current Offset Phase A for CT input	R/W	Default:2048 Range:0 to 8192	
T_AMBIENT_OFFSET (TCtrlOffset)	138	Offset for controls temperature	R/W	Default:683 Range: -8192 to 8192	
V_DIFF_LINE_A_SCALAR (VReactorLineScalarA)	139	Line reactor voltage scalar phase A	R/W	Default:16384 Range: -32768 to 32767	

Onset and Delay Register Map

The Onset and Delay Register map contains parameters used by the PQconnect board for fault and status detection logic. Onset is the level at which the fault/status detection activates changing the threshold can cause fault to occur earlier or later. Clear is the level at which the fault/status detection is deemed no longer present and allowing the filter to return to normal operation. Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 56: Onset and Delay Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet/IP Name)	Instance ID	Description	Type	Default & Ranges	Notes
V_LINE_OV_ONSET (VLineOVOnset)	43	Overvoltage onset threshold, (percent rated voltage)	R/W	Default:130 Range:100 to 150	
V_LINE_OV_CLEAR (VLineOVClear)	44	Overvoltage clear threshold, (percent rated voltage)	R/W	Default:125 Range:90 to 140	
V_LINE_OV_DELAY (VLineOVDelay)	45	Overvoltage delay time, (sec)	R/W	Default:2 Range:1 to 3600	
V_LINE_UV_ONSET (VLineUVOnset)	46	Undervoltage phase loss onset threshold, (percent rated voltage)	R/W	Default:75 Range:50 to 90	
V_LINE_UV_CLEAR (VLineUVClear)	47	Undervoltage phase loss clear threshold, (percent rated voltage)	R/W	Default:80 Range:60 to 100	
V_LINE_UV_DELAY (VLineUVDelay)	48	Undervoltage phase loss delay time, (sec)	R/W	Default:1 Range:1 to 3600	
I_LINE_OC_ONSET (ILineOCOnset)	49	Overcurrent onset threshold, (percent rated current)	R/W	Default:150 Range:100 to 200	
I_LINE_OC_CLEAR (ILineOCClear)	50	Overcurrent clear threshold, (percent rated current)	R/W	Default:140 Range:90 to 190	
I_LINE_OC_DELAY (ILineOCDelay)	51	Overcurrent delay time, (sec)	R/W	Default:5 Range:1 to 3600	
I_LOAD_BALANCE_ONSET (ILoadBalanceOnset)	52	Load current balance onset threshold, (percent rated current)	R/W	Default:75 Range:10 to 90	
I_LOAD_BALANCE_CLEAR (ILoadBalanceClear)	53	Load current balance clear threshold, (percent rated current)	R/W	Default:80 Range:10 to 90	
I_LOAD_BALANCE_DELAY (ILoadBalanceDelay)	54	Load current balance delay time, (sec)	R/W	Default:4 Range:1 to 3600	
I_LOAD_BALANCE_MIN_CURRENT (ILoadBalanceMin)	55	Load current balance minimum detect current, (percent rated current)	R/W	Default:50 Range:10 to 100	
I_TUNE_OC_ONSET (ITuneOCOnset)	56	Tune overcurrent onset threshold, (Percent rated current)	R/W	Default:150 Range:100 to 200	
I_TUNE_OC_CLEAR (ITuneOCClear)	57	Tune overcurrent clear threshold, (Percent rated current)	R/W	Default:140 Range:90 to 190	
I_TUNE_OC_DELAY (ITuneOCDelay)	58	Tune overcurrent delay time, (sec)	R/W	Default:4 Range:1 to 3600	

I_TUNE_UC_ONSET (ITuneUCOnset)	59	Tune circuit fundamental undercurrent onset threshold , (percent rated current)	R/W	Default:65 Range:10 to 100	
I_TUNE_UC_CLEAR (ITuneUCClear)	60	Tune circuit fundamental undercurrent clear threshold, (percent rated current)	R/W	Default:70 Range:15 to 100	
I_TUNE_UC_DELAY (ITuneUCDleay)	61	Tune circuit fundamental undercurrent delay time, (sec)	R/W	Default:3 Range:1 to 3600	
I_TUNE_BALANCE_ONSET (ITuneBalanceOnset)	62	Tune circuit current balance onset threshold, (percent rated current)	R/W	Default:75 Range:10 to 90	
I_TUNE_BALANCE_CLEAR (ITuneBalanceClear)	63	Tune circuit current balance clear threshold , (percent rated current)	R/W	Default:80 Range:10 to 90	
I_TUNE_BALANCE_DELAY (ITuneBalanceDelay)	64	Tune circuit current balance delay time , (sec)	R/W	Default:2 Range:1 to 3600	
T_AMBIENT_OT_ONSET (TCtrlOTOnset)	65	Controls overtemperature onset threshold , (10 = 1.0 deg C)	R/W	Default:700 Range:100 to 850	
T_AMBIENT_OT_CLEAR (TCtrlOTClear)	66	Controls overtemperature clear threshold , (10 = 1.0 deg C)	R/W	Default:600 Range:50 to 800	
T_AMBIENT_OT_DELAY (TCtrlOTDelay)	67	Controls overtemperature delay time , (sec)	R/W	Default:5 Range:1 to 3600	
STATUS_T_AMBIENT_UT_ONSET (TCtrlUTOnset)	68	Controls under temperature onset threshold, (10 = 1.0 deg C)	R/W	Default:0 Range:0 to 0	**EtherNet Only: Reserved Does not exist in Database**
STATUS_T_AMBIENT_UT_CLEAR (TCtrlUTClear)	69	Controls under temperature clear threshold, (10 = 1.0 deg C)	R/W	Default:0 Range:0 to 0	
STATUS_T_AMBIENT_UT_DELAY (TCtrlUTDelay)	70	Controls under temperature delay time, (10 = 1.0 deg C)	R/W	Default:0 Range:0 to 0	

Tech Access Register Map

The Tech Access Register map contains parameters used developers for testing the PQconnect board and filter or left for future implementation and is only usable for TCI, LLC.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 57: Tech Access Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet/IP Name)	Instance ID	Description	Type	Default & Ranges	Notes
SYS_PEEK_0 (DiagVal0)	304	Diagnostic peek value 0	R	Default:0	A diagnostic Feedback variable used by Production and Engineering for Testing and Field Support.
SYS_PEEK_1 (DiagVal1)	305	Diagnostic peek value 1	R	Default:0	
SYS_PEEK_2 (DiagVal2)	306	Diagnostic peek value 2	R	Default:0	
SYS_PEEK_3 (DiagVal3)	307	Diagnostic peek value 3	R	Default:0	
TEST_VOLTAGE (TestVoltage)	13	Unit test voltage, (10 = 1.0 Volts)	R/W	Default:0 Range:0 to 6900	Factory Used Parameter. Used to check if Filter was configured with the correct test Voltage.

TEST_FREQUENCY (TestFreq)	14	Unit test frequency, (Hz)	R/W	Default:0 Range:0 to 60	Factory Used Parameter. Used to check if Filter was configured with the correct test frequency.
SYS_POKE_0 (Poke0)	166	Diagnostic poke variable 0	R/W	Default:0 Range:-32768 to 32767	
SYS_POKE_1 (Poke1)	167	Diagnostic poke variable 1	R/W	Default:0 Range:-32768 to 32767	
SYS_POKE_2 (Poke2)	168	Diagnostic poke variable 2	R/W	Default:0 Range:-32768 to 32767	
SYS_POKE_3 (Poke3)	169	Diagnostic poke variable 3	R/W	Default:0 Range:-32768 to 32767	
SYS_PEEK_ADDR_0 (PeekAddr0)	170	Diagnostic peek address 0	R/W	Default:0 Range:0 to 65535	
SYS_PEEK_ADDR_1 (PeekAddr1)	171	Diagnostic peek address 1	R/W	Default:0 Range:0 to 65535	
SYS_PEEK_ADDR_2 (PeekAddr2)	172	Diagnostic peek address 2	R/W	Default:0 Range:0 to 65535	
SYS_PEEK_ADDR_3 (PeekAddr3)	173	Diagnostic peek address 3	R/W	Default:0 Range:0 to 65535	
BGM_PASSKEY_A_EIP (DiagFb1)	313	Diagnostic Feedback Parameter 1	R	Default:0	Ethernet Enabled but Mapped to Modbus Instance: BGM_PASSKEY_A Read only Value of BGM Password - High Bytes
BGM_PASSKEY_B_EI (DiagFb2)	314	Diagnostic Feedback Parameter 2	R	Default:0	"Ethernet Enabled but Mapped to Modbus Instance: BGM_PASSKEY_B Read only Value of BGM Password - Low Bytes
DIAGONSTIC_FEEDBACK_3 (DiagFb3)	315	Diagnostic Feedback Parameter 3	R	Default:0	**EtherNet Only: Reserved Does not exist in Database.**
DIAGONSTIC_FEEDBACK_4 (DiagFb4)	316	Diagnostic Feedback Parameter 4	R	Default:0	
SYS_COM_ACTIVE (DiagFb5)	317	Diagnostic Feedback Parameter 5	R	Default:0	System Communication Status, bit 0 = Modbus RTU active, bit 1 = Bluetooth active, bit 2 = EtherNet/IP active
SYS_CNT_MIN_OFF_TIMER_EIP (DiagFb6)	318	Diagnostic Feedback Parameter 6	R	Default:0	Ethernet Enabled but Mapped to Modbus Instance: SYS_CNT_MIN_OFF_TIMER Displays count down time for contactor re-closures. Once this timer expires contactor will change the contactor state to close. Default: 60 seconds Range: 30 to 300 seconds

PARAM_ACCESS_LEVEL_EIP (DiagFb7)	319	Diagnostic Feedback Parameter 7	R	Default:0	Ethernet Enabled but Mapped to Modbus Instance: PARAM_ACCESS_LEVEL_RO Determines the Level of parameter access to read and/or change parameter inputs. 0 = Base access 1 = Tech access 2 = Factory access
DIAGONSTIC_FEEDBACK_9 (DiagFb9)	320	Diagnostic Feedback Parameter 7	R	Default:0	**EtherNet Only: Reserved Does not exist in Database**
DIAGONSTIC_FEEDBACK_10 (DiagFb10)	321	Diagnostic Feedback Parameter 10	R	Default:0	
DIAGONSTIC_FEEDBACK_11 (DiagFb11)	322	Diagnostic Feedback Parameter 10	R	Default:0	
DIAGONSTIC_FEEDBACK_12 (DiagFb12)	323	Diagnostic Feedback Parameter 12	R	Default:0	
DIAGONSTIC_FEEDBACK_13 (DiagFb13)	324	Diagnostic Feedback Parameter 13	R	Default:0	
DIAGONSTIC_FEEDBACK_14 (DiagFb14)	325	Diagnostic Feedback Parameter 14	R	Default:0	
DIAGONSTIC_FEEDBACK_15 (DiagFb15)	326	Diagnostic Feedback Parameter 15	R	Default:0	
DIAGONSTIC_FEEDBACK_16 (DiagFb16)	327	Diagnostic Feedback Parameter 16	R	Default:0	
DIAGONSTIC_FEEDBACK_8 (DiagFb8)	328	Diagnostic Feedback Parameter 8	R	Default:0	
DIAG_SETPOINT_1 (DiagSP1)	190	Diagnostic Setpoint Parameter 1	R/W	Default:0 Range:0 to 0	**EtherNet Only: Reserved Does not exist in Database.**
DIAG_SETPOINT_2 (DiagSP2)	191	Diagnostic Setpoint Parameter 2	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_3 (DiagSP3)	192	Diagnostic Setpoint Parameter 3	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_4 (DiagSP4)	193	Diagnostic Setpoint Parameter 4	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_5 (DiagSP5)	194	Diagnostic Setpoint Parameter 5	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_6 (DiagSP6)	195	Diagnostic Setpoint Parameter 6	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_7 (DiagSP7)	196	Diagnostic Setpoint Parameter 7	R/W	Default:0 Range:0 to 0	

DIAG_SETPOINT_8 (PROC_DATA_CMD_EN)	197	Diagnostic Setpoint Parameter 8	R/W	Default:0 Range:0 to 1	Enables and Disables Implicit Setpoint Writes. Only used for Passive Filters with EtherNet/IP Connectivity. 0 = Implicit IO Writes Disabled 1 = Implicit IO Writes Enabled
DIAG_SETPOINT_9 (DiagSP9)	198	Diagnostic Setpoint Parameter 9	R/W	Default:0 Range:0 to 0	**EtherNet Only: Reserved Does not exist in Database.**
DIAG_SETPOINT_10 (DiagSP10)	199	Diagnostic Setpoint Parameter 10	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_11 (DiagSP11)	200	Diagnostic Setpoint Parameter 11	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_12 (DiagSP12)	201	Diagnostic Setpoint Parameter 12	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_13 (DiagSP13)	202	Diagnostic Setpoint Parameter 13	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_14 (DiagSP14)	203	Diagnostic Setpoint Parameter 14	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_15 (DiagSP15)	204	Diagnostic Setpoint Parameter 15	R/W	Default:0 Range:0 to 0	
DIAG_SETPOINT_16 (DiagSP16)	205	Diagnostic Setpoint Parameter 16	R/W	Default:0 Range:0 to 0	
V_OUT_FUND_HZ (FFund)	270	Load output voltage fundamental frequency, (Hz)	R	Default:0	
V_IN_CARRIER_HZ (FCarrier)	271	Estimated input voltage carrier frequency, (Hz)	R	Default:0	
FUND_TRACKING_MODE (FundFreqTrackMode)	111	Fundamental frequency tracking mode	R/W	Default:0 Range:0 to 0	
FUND_TRACKING_FILTER _GAIN (FundFreqFiltGain)	112	Fundamental frequency reference filter gain	R/W	Default:0 Range:0 to 0	

Read Only Register Map

Note that some parameters shown below may not exist in the parameter database/ or shown in PQVision. These parameters have been reserved for future use.

Note: *All parameters with an asterisk (*) in the description will require the Tech level access codes parameter key A: 0x007D (125) and parameter key B: 0xEA6E (60014). All parameters are enabled for communication to EtherNet/IP unless explicitly stated otherwise in the Notes Column of the Table.*

Table 58: Read Only Feedback and Setpoint Parameters Register Map

Parameter Name (EtherNet/IP Name)	Instance ID	Description	Type	Default & Ranges	Notes
DSP_MODEL_NUM_RO (DSPModelNum)	208	Digital Signal Processor DSP model number	R		System Model Numbers 0 = Undefined 3 = Sim 101 = HSD 102 = HGL 103 = HGP 104 = HSL 105 = HSE 200 = KIT - BLANK 202 = KIT - HGL 203 = KIT - HGP 205 = KIT – HSE
HMS_MODEL_NUM_RO (FBModelNum)	210	Fieldbus communications processor model number	R	Default:0	Ethernet Hardware Version Number Notifies the user what type of Module is connected.
BGM_MODEL_NUM_RO (WLModelNum)	212	Wireless communications firmware model number	R	Default:0	Module Revision Code for Bluetooth Processor 0 = Null 1 = BGM111 2 = BGM210 3 = BGM220

Assembly Objects

All assembly objects used for EtherNet/IP are of a connection type CLASS 1 for a CIP generic Message type. Class 1 connection refers to an implicit IO connection where a scanner device makes a connection with an adapter device and requests an implicit I/O connection. The maximum request packet interval (RPI) is 10Hz (100ms).

Consuming Assembly Data

Consuming Assembly Data or also known as Output Assembly data is data moving from the scanner to the device which allows the PQconnect to write data. The instance ID is **150 (0x96)** with a size of 18 bytes, 2 bytes per parameter.

Table 59: Consuming Assembly Data

Bytes	Parameter Name	Index	Info	Data Type
0-1	ParamCmd	1	0 = NoCmd, 1 = Idle, 9 = Save, 21 = SetBasicAccess, 25 = SetTechAccess, 30 = SetFctryAccess, 42 = Reboot, 150 = Load, 200 = LoadNonCalDef, 255 = FctryDef, 300 = LoadUnitCalDef	Signed 16–bit integer value
2-3	WaveformTrigCmd	2	0 = NoTrig, 1 = Trig	
4-5	ResetCmd	3	0 = NoRst, 1 = Rst	
6-7	ParamKeyA	4		
8-9	ParamKeyB	5		
10-11	ControlMode	8	0 = ForceOpen, 1 = ForceClose, 2 = AutoLoad, 3 = AutoPF, 4 = ExtInput, 5 = NoCnt	
12-13	AutoCloseEn	9		
14-15	DiagSP5	194		
16-17	DiagSP6	195		

Producing Assembly Data

Producing Assembly Data or also known as Input Assembly data is data moving towards the scanner which allows the PQconnect to read data. The instance ID for this Producing Data is **100 (0x64)** with a size of 180 bytes, 2 bytes per parameter.

Table 60: Producing Assembly Data

Bytes	Parameter Name	Index	Info	Data Type
0-1	GridVoltage	215		Signed 16–bit integer value.
2-3	GridFrequency	216		
4-5	GridRotation	217	0 = Auto, 1 = ABC, 2 = AC	
6-7	GridSyncLocked	218		
8-9	VLineABRMS	219		
10-11	VLineBCRMS	220		
12-13	VLineCARMS	221		
14-15	VLineABTHD	222		
16-17	VLineBCTHD	223		
17-19	VLineCATHD	224		
20-21	ILineARMS	225		
22-23	ILineBRMS	226		Signed 16–bit integer value.
24-25	ILIneCRMS	227		
26-27	ILineATHD	228		
28-29	ILineBTHD	229		
30-31	ILineCTHD	230		
32-33	ILineATDD	231		
34-35	ILineBTDD	232		
36-37	ILineCTDD	233		
38-39	VLoadABRMS	234		
40-41	VLoadBCRMS	235		
42-43	VLoadCARMS	236		
44-45	VLoadABTHD	237		
46-47	VLoadBCTHD	238		
48-49	VLoadCATHD	239		
50-51	ILoadARMS	240		
52-53	ILoadBRMS	241		
54-55	ILoadCRMS	242		
56-57	ILoadATHD	243		
58-59	ILoadBTHD	244		
60-61	ILoadCTHD	245		
62-63	VTuneABRMS	246		
64-65	VTuneBCRMS	247		Signed 16–bit integer value
66-67	VTuneCARMS	248		
68-69	VTuneABTHD	249		
70-71	VTuneBCTHD	250		

72-73	VTuneCATHD	251		
74-75	ITuneARMS	252		
76-77	ITuneBRMS	253		
78-79	ITuneCRMS	254		
80-81	ITuneATHD	255		
82-83	ITuneBTHD	256		
84-85	ITuneCTHD	257		
86-87	SLine	258		
88-89	PLine	259		
90-91	QLine	260		
92-93	PFLine	261		
94-95	SLoad	262		
96-97	PLoad	263		
98-99	QLoad	264		
100-101	PFLoad	265		
102-103	PLoadAlt	266		
104-105	VLoadABRatio	267		
106-107	VLoadBCRatio	268		Signed 16–bit integer value.
108-109	VLoadCARatio	269		
110-112	FFund	270		
112-113	FCarrier	271		
114-115	CntClosed	272		
116-117	PowerOn	273		
118-119	StatusOK	274		
120-121	AtCapacity	275		
122-123	TControl	276		
124-125	CapWrn	278		
126-127	FilterStatusActiveA	279		
128-129	FilterStatusActiveB	280		
130-131	LineStatusActive	281		
132-133	LoadStatusActive	282		
134-135	ParamState	287		
136-137	SysState	288		
138-139	CntStatus	289		
140-141	RelayInputStatus	290		
142-143	DSMode	291		
144-145	WLStatus	293	0 = idle, 1 = advertising, 2 = connected	
146-147	IntHeartbeat	298		Signed 16–bit integer value.
148-149	BGHeartbeat	299		
150-151	DiagFb5	317		
152-153	DiagFb6	318		
154-155	DiagFb7	319		

156-157	DiagFb9	320		
158-159	DiagFb10	321		
160-161	DiagFb11	322		
162-163	DiagFb12	323		
164-165	DiagFb13	324		
166-167	DiagFb14	325		
168-169	DiagFb15	326		
170-171	DiagFb16	327		
172-173	DiagFb8	328		
174-175	RatedCurrent	10		
176-177	RatedVoltage	11		
178-179	RatedFreq	12		

Waveform Data

The waveform data displayed by the PQconnect is available over EtherNet/IP using the ADI object class with the code **0xA2** to access data. Refer to Reading and writing to PQconnect Waveform Arrays for more information.

Table 61: Waveform Data

Array Name	Instance	Size	Data Type
TraceA	329	128	Signed 16–bit integer value.
TraceB	330		
TraceC	331		
VLineABPlot	332	192	Signed 16–bit integer value.
VLineBCPlot	333		
VLineCAPlot	334		
ILineAPlot	335	192	Signed 16–bit integer value.
ILineBPlot	336		
ILineCPlot	337		
VLoadABPlot	338	192	Signed 16–bit integer value.
VLoadBCPlot	339		
VLoadCAPlot	340		
ILoadAPlot	341	192	Signed 16–bit integer value
ILoadBPlot	342		
ILoadCPlot	343		
DiagAPlot	344	192	Signed 16–bit integer value.
DiagBPlot	345		
DiagCPlot	346		
VLineABSpectrum	347	50	Signed 16–bit integer value.
VLineBCSpectrum	348		
VLineCASpectrum	349		
ILineASpectrum	350	50	Signed 16–bit integer value.
ILineBSpectrum	351		
ILineCSpectrum	352		
VLoadABSpectrum	353	50	Signed 16–bit integer value.
VLoadBCSpectrum	354		
VLoadCASpectrum	355		
ILoadASpectrum	356	50	Signed 16–bit integer value.
ILoadBSpectrum	357		
ILoadCSpectrum	358		
HistoryLogRecord	359	8	Signed 16–bit integer value.
DiagLogRecord	360	128	

6.0 PQconnect Troubleshooting

HarmonicGuard Passive Filter Status Warning

If the desktop interface indicates a status warning, hover over the status detection for a brief description. Depending on the condition there are multiple ways to try and clear the status warnings.

Warning 	Only qualified electricians should carry out all electrical installation & maintenance work at the Harmonic Filter. Disconnect all sources of power to the and connected equipment before working on the equipment. Do not attempt any work on a powered filter. All HarmonicGuard units contain high voltages and capacitors. Wait at least five minutes after disconnecting the power from the filter before attempting to service the conditioner. Check for zero voltage between all terminals on the capacitors. Also, check for zero voltage between all phases of the input and output lines. All maintenance and troubleshooting must be done by a qualified electrician. Failure to follow standard safety procedures may result in death or serious injury. **Unless an external disconnect means has been provided everything ahead of the filter circuit breaker, including the reactors, will still be energized.**

Receiving Inspection

The connectivity board has been thoroughly inspected and functionally tested at the factory and carefully packaged for shipment. After receiving the unit, immediately inspect the shipping container and report any damage to the carrier that delivered the unit. Verify that the part number of the unit received is the same as the part number listed on the purchase order.

Connectivity Board Problem

The HarmonicGuard Filter is comprised of five major components: the PQconnect connectivity board, the line reactor, the tuning reactor, the contactor, and the capacitors. The PQconnect PCB contains diagnostic LEDs.

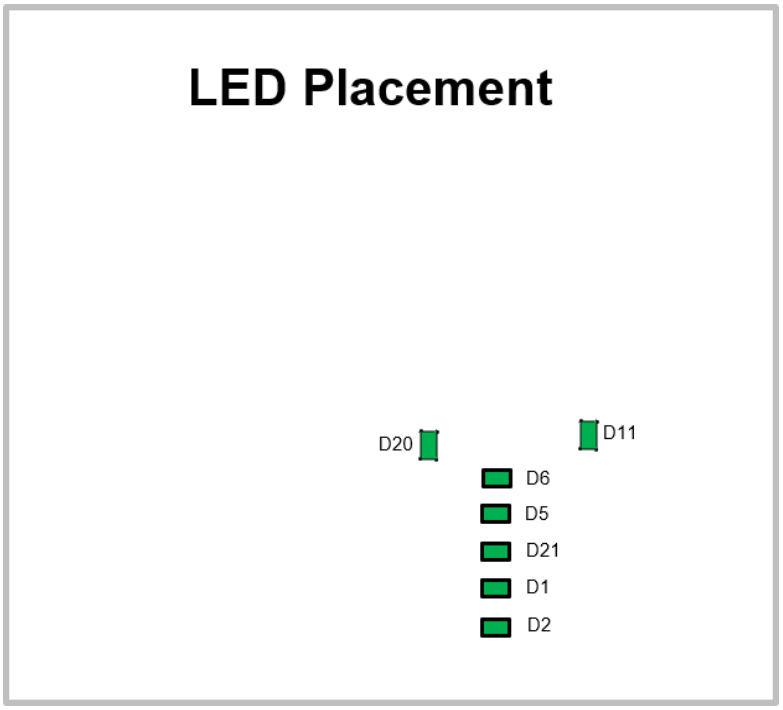


Figure 55: PQconnect LED Placements

Table 62: LED Functions

LED	LED Color	Description
D1	Green	Tuned circuit contactor control 1
D2	Green	Optional 2nd Status LED/ tuned circuit contactor control 2
D5	Green	Status LED
D6	Green	Microprocessor Status LED
D11	Green	RS485 Communication is active
D20	Green	24V LED
D21	Green	5V LED

Note: *Status LED's will blink according to the filter status. The microprocessor status LED will blink 1hz if the filter is okay, however if there has been an alert the LED will blink according to the status detection. It will initially start with a slow blink (2 = filter lower, 3 = filter upper, 4 = filter input, 5 = filter load) then blink fast depending on the status code.*

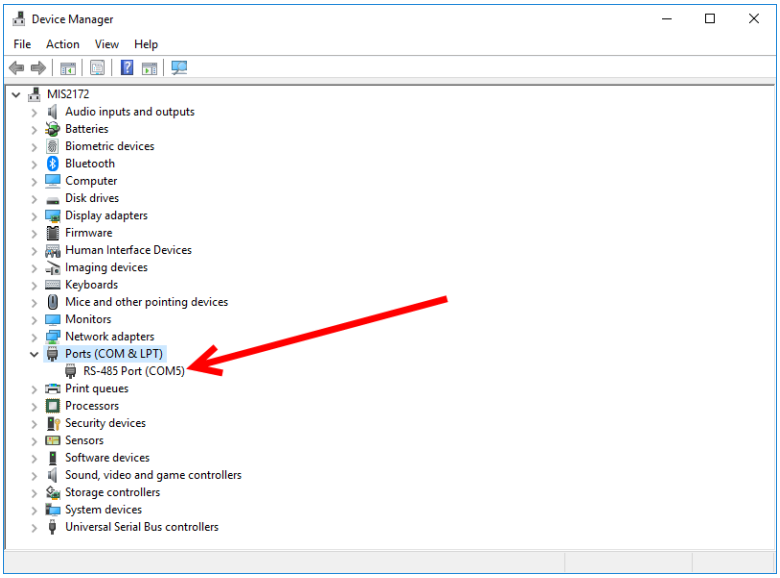
The table below shows the specified blinks for each status condition.

Table 63: Specified Blinks for Each Status Condition

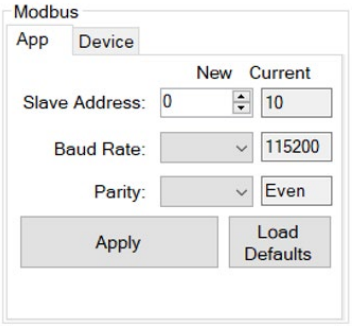
Status Condition	Group (Slow blinks)	LED Specifier (Fast Blinks)
Tune Phase A Loss	2	1
Tune Phase B Loss		2
Overvoltage Phase C		3
Tune Balance Loss Phase A		4
Tune Balance Loss Phase B		5
Tune Balance Loss Phase C		6
Tune Undercurrent Phase A		7
Tune Undercurrent Phase B		8
Tune Undercurrent Phase C		9
Tune Overcurrent Phase A		10
Tune Overcurrent Phase B		11
Tune Overcurrent Phase C		12
Under Temperature		13
Over Temperature		14
CPU Error		15
Tune Reactor Thermal		16
Reclose Limit	3	1
Line Reactor Thermal		4
Filter Line Phase A Loss	4	1
Filter Line Phase B Loss		2
Filter Line Phase C Loss		3
Filter Line Overvoltage Phase A		4
Filter Line Overvoltage Phase B		5
Filter Line Overvoltage Phase C		6
Filter Line Frequency Mismatch		7
Filter Line High THVD		8
Filter Line Phase Rotation		9
Filter Load Phase A imbalance	5	1
Filter Load Phase B imbalance		2
Filter Load Phase C imbalance		3
Filter Load Phase A Overcurrent		4
Filter Load Phase B Overcurrent		5
Filter Load Phase C Overcurrent		6

Communication Problems

- J5 Communication Header with the power de-energized from the filter, check wiring leading to J5 header
  - If the user is using a different RS485 converter than the example above, please follow the datasheet for the A & B signals and ground for proper setup.
- Ensure the drivers of the RS485 to USB converter is installed to the computer. Simple way of checking while the RS485 converter is connected is to go to the device manager and scroll down to ports. There will be a device connected to the ports. If your device is not listed, the user will need to install the correct drivers of the RS485 converter.



- PQvision App Load Defaults
  - With the RS485 Converter connected to the circuit board
  - Energize Filter
  - Open PQvision desktop interface
  - Go to **Settings**
  - Select Load Defaults
  - Select Apply
  - Default Modbus settings should be applied. Try connecting to the COM port
    - If this doesn't work de-energize power to the filter and try flipping the A and B signal wires leading to the J5 header of the circuit board.



- Hard Reset Modbus settings (Worst Case)
  - To perform a hard reset of Modbus settings the user will need to remove jumper J20 with the power de-energized from the filter. Once the jumper is removed connect the RS485 converter to J5 header and energize filter.
  - Open PQvision
  - Confirm there is a COM port under Communication and try to connect
    - Note if connecting to the COM port does not work, try flipping the A and B signal wires leading to the J5 header of the circuit board
  - Load defaults and apply
  - Save settings and de-energize filter
  - Connect jumper to J20
  - Energize filter
  - Try connecting to PCB
    - All Modbus settings should be set to default settings at this point
    - If the board doesn't connect after trying hard reset contact TCI Tech-Support

Debug Status Conditions

Based on the status condition there are various ways a status can appear. Some status conditions are not critical and are used as warnings. Before investigating the filter internally, disengage supply voltage to the filter. If problems persist after initial checks, please contact TCI Tech-Support.

Table 64: Status Conditions

Status Condition	Description	Debug/ Resolution
Filter Tune Phase Loss A, B, or C	Phase loss in one of the phases of the filter tune circuit	Check fuses of the tune circuit Check power connections of the tune circuit Check voltage sense wires leading to the board and reactor, make sure they are properly connected
Filter Tune balance Loss Phase A, B, or C	Filter tune imbalance on one of the phases.	Check power connections of the tune circuit Check voltage sense wires leading to the board and reactor, make sure they are properly connected
Filter Tune Undercurrent Phase A, B, or C	Filter tune current is seeing less current than expected	Make sure you have the right size filter selected for the application. Based on the model number the filter will expect a certain amount of current in the tune circuit. Check voltage sense wires leading to the board and reactor, make sure they are properly connected
Filter Tune Overcurrent Phase A, B, or C	Filter tune current is seeing more current than expected	Make sure you have the right size filter selected for the application. Based on the model number the filter will expect a certain amount of current in the tune circuit. Check voltage sense wires leading to the board and reactor, make sure they are properly connected
Under Temperature	Filter ambient temperature is operating below threshold (-40C)	Check fuses of control power transformers leading to the heater.
Over Temperature	Filter ambient temperature is operating above threshold (+75C)	Check fuses of control power transformers leading to fans. Make sure fans are operating
CPU Error	Processor Malfunction	Power cycle unit and if issue persists upgrade firmware and/or contact tech support
Reactor Thermal Switch	Reactor Thermal Switch is open	Check thermal switch connections to PCB and check if thermal switch is damaged
Reclose Limit	Contactor Reclose is at its limit	The contactor will close for many reasons if you are experiencing any issues with the contactor view Table 62: Contactor Codes for further details.
Filter Line Phase Loss A, B, or C	Filter line phase loss	Check fused disconnect or circuit breaker upstream of the filter. Check input power connections to the filter
Filter Line Overvoltage Phase A, B, or C	Filter overvoltage on one of the phases.	Check input power connections to filter Check voltage setpoint, based on the filter model number entered the filter is expecting a certain input voltage.
Filter Frequency Mismatch	Line Frequency does not match program setpoint	During the user calibration the filter frequency is set based on the model number entered. Verify the frequency
Filter Line High THVD	High voltage Total Harmonic Distortion	Check fuses leading to filter capacitors If fuses are not blown, measure Capacitance of the capacitors Check power connections of the unit
Filter Line Rotation	Filter phase rotation	Phase rotation differs from default setting. Status condition can be turned off or switched to ACB
Filter Load Phase Imbalance A, B, or C	Phase imbalance between the phases	Check power connections of the line side of the filter Check voltage sense wires leading to the board and reactor, make sure they are properly connected
Filter load Overcurrent Phase A, B, or C	Filter output current is more than expected	Make sure you have the right size filter selected for the application. Based on the model number the filter will expect a certain amount of current in the tune circuit. Check voltage sense wires leading to the board and reactor, make sure they are properly connected

Contactor Problem

Parameter 257 Contactor Status can be used to determine why the PQconnect board is not closing the tuned circuit contactor. The following tables define what a specific contactor status code value means and list potential resolutions to allow the contactor to close.

Note that some setpoint parameters require tech level parameter access to be viewable over the serial connection or via the PQvision software. The tech level parameter access key is available above.

Table 65: Contactor Codes

Code	Description	Resolution
1	Contactor is already commanded closed.	The PQconnect is presently commanding the tuned circuit contactor to be closed. If the contactor is not closing check the wiring from the PCB J11 control relay header to the tuned circuit contactor and 120VAC control power transformer.
2	Contactor is open due to a Force Open control mode.	The present contactor control mode (feedback parameter 250) is set to Force Open. This control mode will always keep the contactor open. To change the control mode, see setpoint parameter 510.
3	Contactor is open due to an automatic load control mode and insufficient load Amps to close the contactor.	The present contactor control mode (feedback parameter 250) is set to Automatic Load Control and the measured filter load Amps are below the configured close threshold (feedback parameter 270). The contactor will be closed when the filter load Amps exceed the close threshold. The contactor close filter load current threshold can be adjusted via setpoint parameter 570. The contactor close threshold parameter is scaled in units of percent rated nameplate filter current.
4	Contactor is open due to an automatic kVAR control mode.	The present contactor control mode (feedback parameter 250) is set to Automatic kVAR Control and closing the contactor would exceed the max allowable kVAR flowing to the source to be exceeded (feedback parameter 272). The contactor will be closed when the inductive load kVAR minus the capacitive tuned circuit kVAR of the passive filter is below the max kVAR setpoint parameter. The max kVAR setpoint parameter can be adjusted via setpoint 572.
5	Contactor is open due to an external contactor open command.	The present contactor control mode (feedback parameter 250) is set to External Control and the external command is set to open the contactor. The external contactor control command is wired to the PQconnect PCB header J7 where shorting pins 1 and 2 of that header equal a close command. The internal state of the external control command can be audited via feedback parameter 320 in bit position 0. If an external contactor close command is correctly being input to the PQconnect board then confirm the J7 header input is configured as the external control command by verifying feedback parameter 321 is set to a value of 2=external command input. If the input configuration parameter 321 is not set to 2=external command input the input configuration can be changed via setpoint parameter 610.
6	Contactor is open because the PQconnect has been configured without a contactor.	The present contactor control mode (feedback parameter 250) is set to No Contactor Mode. No Contactor mode is typically reserved for HGP units that do not include a tuned circuit control contactor. If your HGP unit does include a tuned circuit contactor but the PQconnect is configured to not support a contactor, please call TCI technical support.

Table 66: Contactor Codes

Code	Description	Resolution
7	Contactor is open due status detection.	The contactor is open due to a filter, filter line, or filter load status detection being detected that is configured to open the tuned circuit contactor when detected. The PQconnect continuously monitors the internal conditions of the HGP passive filter and the external conditions of the filter line and load currents and voltages. Some status conditions, such as tuned circuit overcurrent, are configured to open the tuned circuit contactor when detected as a self-protection feature. The presently configured contactor open actions can be audited using feedback parameters 240-Filter A, 241-Filter B 242-Filter Line and 243 Filter Load. The set or clear status of these contactor open status detections can be viewed via feedback parameters 210-Filter A, 211-Filter B 212-Filter Line and 213 Filter Load. Also, the present value of all status detections and wither they are configured to open the tune circuit contactor when detected can be viewed via the PQvision software settings menu screen. To reset all status conditions and attempt to re-close the contactor the unit can be power cycled, a serial command can be sent over the network interface via setpoint parameter 502, or an external wired reset command can be input to the PQconnect PCB at header J8 where shorting pins 1 and 2 of that header equal a close command. The internal state of the external wired reset command can be audited via feedback parameter 320 in bit position 1. If an external reset command is correctly being input to the PQconnect board then confirm the J8 header input is configured as the external reset command by verifying feedback parameter 322 is set to a value of 1=external reset command input. If the input configuration parameter 322 is not set to 1=external reset command input the input configuration can be changed via setpoint parameter 611.
8	Contactor is open due to a parameter inhibit condition.	The contactor is open because the PQconnect is still loading stored parameters in flash memory. This condition should clear shortly after the unit is powered up. If this contactor status condition persists power cycle the unit and call TCI technical support if the condition does not clear.
9	Contactor is open due to a unit power on delay.	The contactor is open because the PQconnect is waiting for the configured power on delay time to expire. The power on delay time in units of seconds can be viewed via feedback parameter 281. The power on delay time can be adjusted via setpoint parameter 581.
10	Contactor is open due to a calibration inhibit.	The contactor is open because the unit is presently undergoing an internal calibration procedure, or no calibration data has been stored to the unit's flash memory. If this contactor status condition persists power cycle the unit and call TCI technical support if the condition does not clear.
11	Contactor is being held open due to the minimum reclose timer.	An internal contactor close event is pending but the contactor is being held open because it was recently closed, and the minimum reclose time has not been yet achieved. The minimum contactor re-close time in units of seconds is viewable via feedback parameter 285. This time out period allows any residual stored charge in the tune circuit capacitors to be dissipated by bleeder resistors before the tune circuit is re-energized. If a minimum time is not enforced between repeated contactor close events the contactor may re-close and apply line voltage out of phase with the residual voltage on the tuned circuit capacitors. This could cause high currents to flow through the tuned circuit contactor and potentially blow the contactor protective fuses. The remaining time on the minimum contactor re-close timer can be viewed on feedback parameter 286.
12	Contactor is being held open due to close delay timer.	An internal contactor close event is pending but the contactor is being held open because the configured contactor close delay time out period has not yet been achieved. The automatic contactor control modes (load current control and line kVAR control) are configured with contactor close and open delay timers to avoid changing the contactor state due to short transient conditions. The presently configured contactor close delay time in units of seconds is viewable via feedback parameter 274. The contactor close delay time can be adjusted via setpoint parameter 574
13	Contactor is being held open due to the auto reclose delay	An internal contactor automatic reclose event is pending but the contactor is being held open because the configured automatic re-close time has not been achieved yet. The PQconnect continuously monitors the internal conditions of the HGP passive filter and the external conditions of the filter line and load currents and voltages. Some status conditions are configured to open the tuned circuit contactor when detected as a self-protection feature. An optional feature can be enabled (feedback parameter 252) to attempt to re-close the tuned circuit contactor after a status condition has been detected. The auto reclose enable setpoint parameter is parameter 511 and the auto reclose delay time setpoint parameter is parameter 580.

Table 67: Contactor Codes

Code	Description	Resolution
14	Contactor is being held open due to auto reclose limit being reached.	An internal contactor automatic reclose event is pending but the contactor is being held open because the number of re-close attempts in a set time has been exceeded. The PQconnect continuously monitors the internal conditions of the HGP passive filter and the external conditions of the filter line and load currents and voltages. Some status conditions are configured to open the tuned circuit contactor when detected as a self-protection feature. An optional feature can be enabled (feedback parameter 252) to attempt to re-close the tuned circuit contactor after a status condition has been detected. However, if too many re-close attempts (parameter 282) are made within a set time (parameter 283) the unit will stop attempting to auto reclose. To debug which status conditions caused the contactor open event the presently configured contactor open actions can be audited using feedback parameters 240-Filter A, 241-Filter B 242-Filter Line and 243 Filter Load. The set or clear status of these contactor open status detections can be viewed via feedback parameters 210-Filter A, 211-Filter B 212-Filter Line and 213 Filter Load. Also, the present value of all status detections and wither they are configured to open the tune circuit contactor when detected can be viewed via the PQvision software settings menu screen. When the auto re-close limit has been reached a power cycle of the passive filter unit is required to clear the condition and allow the contactor to re-close.

Warning 	Many electronic components located within the filter are sensitive to static electricity. Voltages imperceptible to human touch can reduce the life, affect performance and/or destroy sensitive electronic devices. Use proper electrostatic discharge (ESD) procedures when servicing the filter and its circuit boards.

EtherNet/IP Problem

Any Connection, Configuration, and status information can be shown on PQvision dedicated Ethernet setting page. All data is updated in real-time with Ethernet LED status corresponding to B40 Module LEDS located on the PQconnect board. LED status codes are all labeled on the table below.

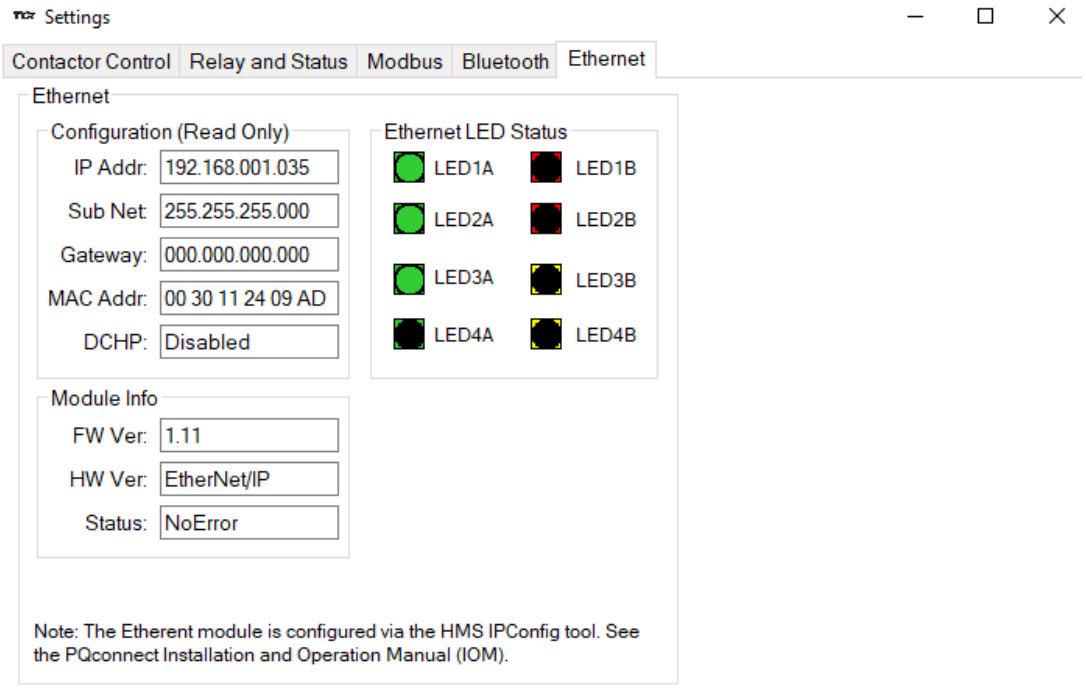


Figure 56: LED Status Codes

Table 68: PQconnect LED Codes

Name	LED PQconnect Ref	LED Color	Off Indicator	On Indicator	Flashing
LED1A	D18	Green	No power, no IP address, or no link	Online, one or more connections established (CIP class 1 or 3)	Online, no connections established
LED1B	D17	Red	No power or no error	Duplicate IP Address, fatal error	On or more connections timed out (CIP Class 1 or 3)
LED2A	D22	Green	No power or no connection	Controlled by a Scanner in Run state	Not configured, Scanner in Idle state
LED2B	D19	Red	No power or no fault	Major fault (EXCEPTION-state, FATAL error etc.)	Recoverable fault(s). Module is configured, but stored parameters differ from currently used parameters
LED3A	D24	Green	Port 1, No 100 Mbit/s link or activity	Port 1, Link established (100 Mbit/s)	Port 1, Link Activity (100 Mbit/s)
LED3B	D23	Yellow	Port 1, No 10 Mbit/s link or activity	Port 1, Link established (10 Mbit/s)	Port 1, Link Activity (10 Mbit/s)
LED4A	D62	Green	Port 2, No 100 Mbit/s link or activity	Port 2, Link established (100 Mbit/s)	Port 2, Link Activity (100 Mbit/s)
LED4B	D25	Yellow	Port 2, No 10 Mbit/s link or activity	Port 2, Link established (10 Mbit/s)	Port 2, Link Activity (10 Mbit/s)

7.0 Maintenance and Service

HarmonicGuard Filter Reliability and Service Life

The HarmonicGuard filter has been designed to provide a service life that equals or exceeds the life of the VFD. It has been thoroughly tested at the factory to assure that it will perform reliably from the time it is put into service. It is recommended that the following maintenance is performed once a year to ensure that the filter will always operate reliably and provide the expected service life.

Periodic Maintenance

Warning 	Only qualified electricians should carry out all electrical installation and maintenance work on the filter. Disconnect all sources of power to the drive and HarmonicGuard filter before working on the equipment. Do not attempt any work on a powered harmonic filter.

Check to see that the installation environment remains free from exposure to excessive dirt and contaminants. Refer to the ***Pre-installation Planning*** section of this manual.

Check to make sure that the enclosure ventilation openings are clean and unobstructed.

Clean the air filter in units that have filtered air inlets. Clean as often as necessary to prevent dirt build- up from impeding air flow.

Check the operation of the cooling fan.

Inspect the interior of the enclosure for signs of overheated components. Clean the interior of the enclosure whenever excess dirt has accumulated.

Torque all power wire connections, loose connections can overheat and damage the filter. All electrical connections must be re-torqued annually.

Troubleshooting

Warning 	Only qualified electricians should carry out all electrical installation and maintenance work on the HarmonicGuard filter. Disconnect all sources of power to the drive and filter before working on the equipment. Do not attempt any work on a powered harmonic filter. The harmonic filter contains high voltages and capacitors. Wait at least five minutes after disconnecting power from the filter before you attempt to service the harmonic filter. Check for zero voltage between all terminals on the capacitors. Also, check for zero voltage between all phases of the line side of the fuses, Fu1(a)–Fu2(a)–Fu3(a), and all input terminals L1, L2 and L3 of the line reactor (KDR). All setup, maintenance, and troubleshooting must be done by a qualified electrician. Failure to follow standard safety procedures may result in death or serious injury.

Note: *when disconnecting wires from components and terminations, mark the wires to correspond to their component and terminal connection.*

Replacement Parts

If replacement parts are needed, please contact your TCI representative. To ensure that the filter continues to perform to its original specifications, replacement parts should conform to TCI specifications.

Factory Contacts and Tech Support

For technical support, contact your local TCI distributor or sales representative. You can contact TCI directly at 800-TCI-8282. Select "Customer Service" or "Tech Support" and have your HarmonicGuard filter nameplate information available.

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