HarmonicGuard® Series

Drive Applied Harmonic Filter Kit

Installation, Operation, and Maintenance Manual

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Revision	Description	Date
A	Release	
B	Added 600 V Option	10/22/14
C	Updated Kit Numbering system	02/03/15
D	Updated Kit Usage Instructions	09/13/16
E	Updated 480 V 60 Hz HGP Fuse Tables	06/26/17
F	Updated 480 V 60 Hz HGP Fuse Tables	10/19/17
G	Updated Fuse Requirements Table	12/01/17
H	Updated Filter Schematics	04/23/18
J	Update to include compliance	11/15/18
K	Update to include PQconnect	08/22/19
L	Update to include Bluetooth capability with PQconnect	09/25/19
M	Fixes to the PQconnect section	11/11/19
N	Updates to the PQconnect section	01/06/20
O	Updates to Installation checklist, performance guarantee, and PQconnect section	04/29/21
P	Addition of torque values and updates to the parameter list	07/18/22
Q	Merged HGL Kits Information and added EtherNET I/P implementation to PQconnect, PQconnect Support for HGL Kits.	02/06/24
R	Updated the Kit Calibration UI and added a new feature	03/01/24

Performance Guarantee

Select and install the appropriate HarmonicGuard® passive filter kit 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 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 passive filters can also provide similar performances in other drive applications such as constant torque, DC drives & other phase-controlled rectifiers. However actual THID levels can vary by load and or speed & therefore, cannot be guaranteed.
Consult factory for assistance when applying HarmonicGuard passive 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: 60Hz ± 0.75Hz

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

Balanced Line Voltage: Within 0.5%

Background Voltage Distortion: < 0.5% THVD

For any drive applications, the input VFD current waveform shall be consistent with that of a VFD with 3% AC line reactance at full load and a 1.5% source impedance.

NOTE: The presence of background voltage distortion will cause motors and 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 voltage distortion wiring of the HGP/HGL filter kit.

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

1.0 Safety

The information presented in this manual covers the HarmonicGuard Kits only ~ For the full HGP or HGL manual please visit* Transcoil's webpage*.

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 Filter Kit. TCI has produced this filter for use in many variable frequency drive (VFD) applications that require input power line harmonic current reduction. This manual gives an overview of how to install, operate, and maintain the HarmonicGuard Filter Kit. Please contact TCI Technical Support or visit our Support Page for additional information.

Intended Audience

This manual is intended for use by all personnel responsible for the assembly, wiring installation, operation, and maintenance of the HarmonicGuard filters and kits. Such personnel are expected to have knowledge of electrical wiring practices, electronic components, and electrical schematic symbols. Panel design using a TCI HarmonicGuard Filter Kit should be performed with appropriate engineering supervision, so the design meets the requirements based on materials utilized in the construction of the panel, wiring practices followed by your shop, and the actual ambient conditions of the components for each application.

HarmonicGuard Family Description

The HarmonicGuard (HG) passive filter offers an array of harmonic mitigation solutions designed for specific applications and industry. The HarmonicGuard Base 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 Harmonic Current Distortion (THID) performance for any load conditions with a current TDD of 5%, with UL Listed Type 1, 3R, and 12 enclosures choices.

The HGL Solution is the industry leading solution for harmonic mitigation solution on generators. Offering 5% Total Harmonic Current Distortion (THID) performance for any load conditions with a current TDD of 5%, ideal for any low capacitance application.

Receiving Inspection

The HarmonicGuard Filter Kit has been thoroughly inspected 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 components you received is the same as the part numbers listed on the engineering drawings for the kit.

Storage Instructions

If the HarmonicGuard Kit filter is to be stored before use, ensure it is stored in a location that conforms to published storage humidity and temperature specifications stated within this manual.

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 ratings of the filter kit must match the input voltage rating of the connected load. The filter's rated frequency must match the power source's line frequency. The horsepower and current ratings of the filter kit must be appropriate for the connected load.

Kit Usage Recommendations

Panel design using a TCI HarmonicGuard Filter Kit should be performed with appropriate engineering supervision, so the design meets the requirements based on materials utilized in the construction of the panel, wiring practices followed by your shop, and the actual ambient conditions of the components for each application.

When properly designed, assembled, and installed, the completed product is intended to be suitable for use with 3-phase diode bridge rectifier loads, such as PWM AC drives. SCR or thyristor loads, such as DC drives, would require a different filter configuration outside the scope of this product offering. Please contact TCI Technical Support for additional information.

NOTE: Any Product Kit Drawings and Information can be found at:

Kits Page - TCI, LLC (transcoil.com)

HarmonicGuard Kit Part Numbering System

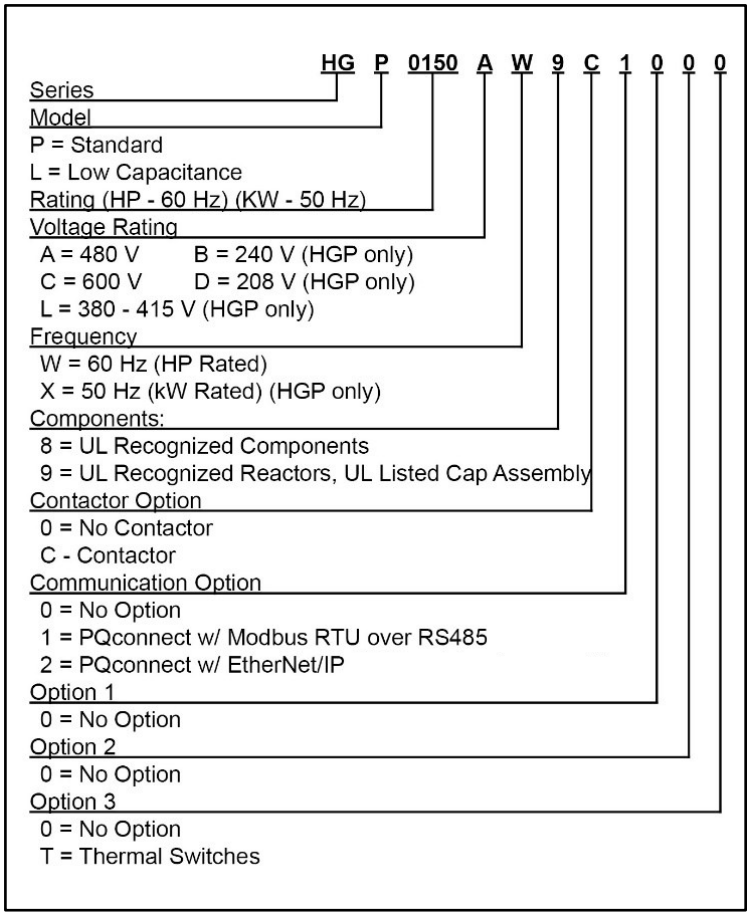


Figure 1 : HarmonicGuard Kit Part Numbering System

Technical Specifications

Table 1: HarmonicGuard® Passive Filter Technical Specifications

Electrical Characteristics	
Voltage Rating	480, 600 VAC 208, 240, 380-415 VAC (HGP Kit Only)
Phase	3
Compliance	IEEE-519 2022
Operating Frequency	60 Hz 50 Hz (HGP Kit Only)
Motor drive input power rating range	HGP: 1.5 – 1000 HP for 480 V units. HGL: 20 - 900 HP for 480/600 V units Power range differs depending on the system's voltage
Immunity from Voltage Distortion	Less than 5% THID at full load with THVD as high as 5% - When configured for High Voltage Background Distortion.
Overload Capability	200% of current rating for up to 3 minutes/per hour
Environmental Conditions	
Operating Temperature	Kit component ambient: 50°C (122°F)
Storage Temperature	60°C (140°F)
Elevation	Up to 2,000 m without derating
Humidity	95% non-condensing
Agency approvals or certifications	
Capacitor Assemblies (In the "7" UL listed or "9" cap assembly Kit version)	UL and cUL Listed
Capacitors	UR and cUR Recognized
Reactors	UR and cUR Recognized
Reactors (In the "7" UL listed Kit version)	UL and cUL Listed
Performance Guarantee	
To meet the requirements for the Performance, Guarantee the minimum system conditions must conform to the following: • At least 1.5% source impedance. • The input VFD current waveform shall be consistent with that of a VFD with 3% AC line reactance at full load	

** Please consult TCI regarding optimum filter performance when applied to DC drives.*

4.0 Installation Guidelines

Installation Checklist

The following are the key points to be followed for a successful installation.

- 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 HarmonicGuard Filter Kit in a suitable environment will help ensure proper performance and normal operating life. Refer to the environmental specifications listed in *Technical Specifications.*

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 the filter kit is installed 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 sufficient 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 sufficient unobstructed space to allow cooling air to flow through the unit.

Mounting the Filter Kit

When mounting the filter kit in your enclosure, you must provide an enclosure that is adequately sized and ventilated sufficiently to prevent overheating. Refer to the applicable kit drawings for rating and dimensions. The maximum temperature of the air around the HarmonicGuard filter capacitors, line reactor, tuning reactor, and optional PQconnect PCB should not exceed 50°C (122°F).

Power Wiring

When selecting a mounting location for the HarmonicGuard Filter Kit, plan for the routing of the power wiring. Make sure all wiring conforms to the requirements of the NEC electrical codes and can handle the max current required according to your filter, for HGP kit reference *Wire Sizing*

NOTE: If your HGP filter kit includes the PQconnect PCB please also read *5.0 PQconnect* for proper mounting and wiring installation.

Panel design using a HarmonicGuard Filter Kit should be performed with appropriate engineering supervision, so the design meets the requirements based on materials utilized in the construction of the panel, wiring practices followed by your shop, and the actual ambient conditions of the components for each application.

Filter's Schematic

The schematics shown below are illustrations of typical HGP filter wiring.

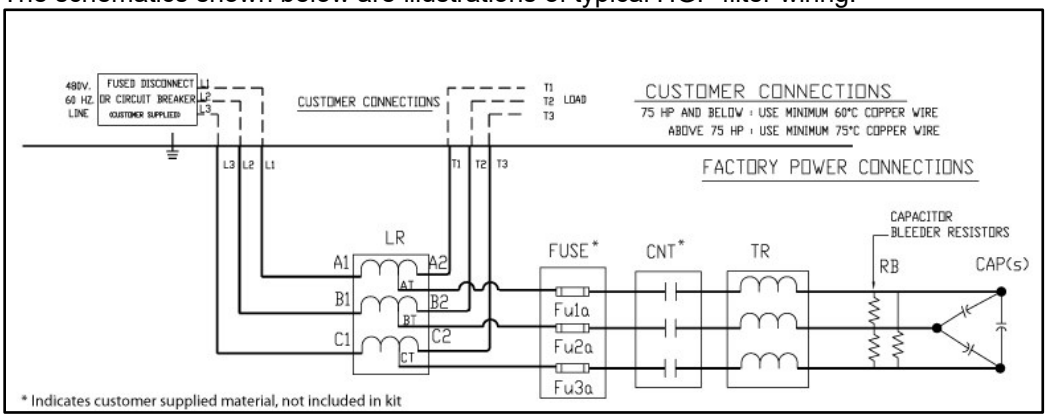


Figure 2 : HGP Filter Wiring for up to 480 V/800 HP

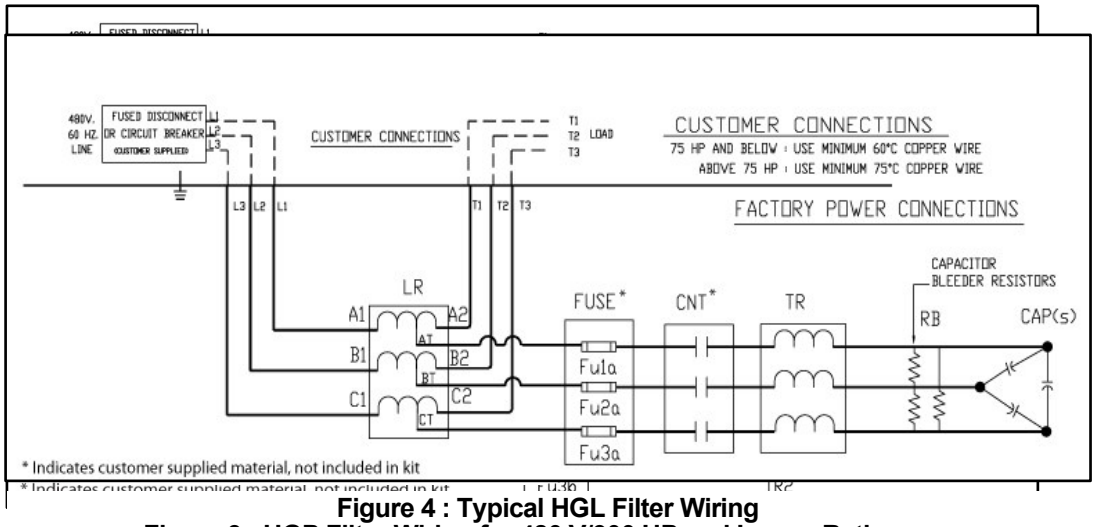


Figure 4 : Typical HGL Filter Wiring

Figure 3 : HGP Filter Wiring for 480 V/900 HP and Larger Rating

The schematic shown below is an illustration of a typical HGL filter wiring.

Wire Sizing

All Wires need to be sized based on the current to be carried, wire insulation temperature rating, panel temperature rating, bundling of wires, and appropriate codes and standards. Wire size between the power source and the filter line reactor, as well as the line reactor and the drive input, are based rated filter line current. Wire size in the branch circuit is based on rated tuned circuit current. If the capacitor wiring is split into separate capacitor branches, the current each branch carries is proportional to the value of capacitance in each branch.

Table 2 : 208 V, 60Hz, HGP Kit

HGP Rating (HP)	Tuned Circuit Current (A)	Line Current (A)
5	10.3	16.7
7.5	17.1	24.2
10	25.7	30.8
15	34.4	46.2
20	42.9	59.4
25	51.5	74.8
30	68.6	88
40	103	114
60	129	169
75	154	211
100	205	273
150	310	396
200	412	528
250	515	660
300	641	792

Table 3 : 240 V, 60Hz, HGP Kit

HGP Rating (HP)	Tuned Circuit Current (A)	Line Current (A)
5	10.3	15.2
7.5	13.7	22
10	17.1	28
15	25.7	42
20	34.4	54
25	42.9	68
30	51.5	80
40	68.6	104
50	77.0	130
60	103	154
75	129	192
100	154	248
125	205	318
150	257	360
200	308	480
250	410	604
300	513	722
400	641	954

Table 4 : 380 - 415 V, 50Hz, HGP Kit

HGP Rating (HP)	Tuned Circuit Current (A)	Line Current (A)
2	1.5	4.3
3	2.2	6.1
7.5	5.1	14
10	8.6	18
15	10.3	27
20	13.7	34
25	25.7	43
30	25.7	51
40	25.7	66
50	42.8	83
60	51.3	103
75	68.4	128
100	77.0	165
125	103	208
150	103	240
175	128	275
200	154	320
250	180	403
300	257	482
350	257	560
400	308	636
450	308	711
500	359	786
600	410	960
700	513	1120
750	513	1200
800	650	1280
900	650	1440
950	650	1520

Table 5 : 480 V, 60Hz, HGP Kit

HGP Rating (HP)	Watts Loss	Tuned Circuit Current (A)	Line Current (A)
1.5	80	0.9	3
3	85	1.5	4.8
5	85	2.2	7.6
7.5	115	5.1	11
10	135	5.1	14
15	190	8.6	21
20	230	10.3	27
25	285	13.7	34
30	240	17.1	40
40	435	25.7	52
50	455	25.7	65
60	600	34.2	77
75	750	42.8	96
100	700	51.3	124
125	815	68.4	156
150	1075	77.0	180
200	1325	103	240
250	1475	128	302
300	1875	154	361
350	1725	180	414
400	1775	205	477
450	2000	231	515
500	2300	257	590
600	1975	308	720
700	1975	359	840
800	2025	410	960
900	1050	230	1080
1000	2500	257/257 (Parallel Branches)	1200

Note: *The addition of the PQconnect option increases Watts Loss by 10.*

Table 6 : 500 V, 60Hz, HGP Kit

HGP Rating (HP)	Tuned Circuit Current (A)	Line Current (A)
5	1.8	6.1
7.5	4.1	9
10	4.1	11
15	6.8	17
20	8.2	22
25	10.9	27
30	13.7	32
40	20.5	41
50	20.5	52
60	27.4	62
75	34.2	77
100	41.0	99
125	54.7	125
150	61.6	144
200	82.1	192
250	103	242
300	123	289
350	144	336
400	164	382
450	185	412
500	205	472
600	246	576
700	287	672
800	328	780
900	369	864
1000	410	960

Table 7 : 480 V, 60Hz, HGL Kit

HGL Rating (HP)	Tuned Circuit Current (A)	Line Current (A)
20	7.6	27
25	9.9	34
30	12.6	40
40	15.2	52
50	20.2	65
60	25.3	77
75	25.3	96
100	38.0	124
125	50.6	156
150	63.3	180
200	76.0	240
250	101	302
300	127	361
350	139	414
400	152	477
450	177	533.5
500	190	590
600	228	720
700	266	840
800	304	960
900	342	1080

Table 8 : 600 V, 60Hz, HGL Kit

HGL Rating (HP)	Tuned Circuit Current (A)	Line Current (A)
20	6.2	22
25	8.2	27
30	10.1	32
40	12.1	41
50	16.7	52
60	20.1	62
75	30.0	77
100	30.0	99
125	40.1	125
150	50.1	144
200	60.0	192
250	80	242
300	100	289
350	110	336
400	120	382
450	140	412
500	150	472
600	181	576
700	211	672
800	241	768
900	271	864

Torque Values

Table 9 : HarmonicGuard (HG) Kit 208 - 240 V 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)

Table 10 : HarmonicGuard (HG) Kit 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	375 lbs-in (42.4 N-m)	Four 600kcmil to 2 AWG	375 lbs-in (42.4 N-m)

Table 11 : HarmonicGuard (HG) Kit 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)

SCCR Ratings

If you need an SCCR greater than the default values of components, for example, 10 kA for terminal blocks or 5 kA for contactors, pay attention to component selection and circuit fusing. Contractors need to be protected by line or branch-tuned circuit fusing based on their published SCCR.

All TCI HarmonicGuard Kits include reactors that are not required to have a short circuit current rating per UL 508A SB4.2.1 Exception 1.

See Table 12 for line fuse requirements to complete 100 kA SCCR for HGP kits and Table 13 for HGL kits. Larger kits include dry-type capacitors that are not required to have a short circuit current rating per UL 508A SB4.2.1 Exception 1. Small horsepower HGP kits (see Table 12) and HGL kits (See Table 13) have a line fuse requirement to reduce incoming 100 kA short circuit current to 10 kA on the panel suitable for the oil-filled capacitors used on these small horsepower ratings.

Table 12 : HGP Kit customer Installed Line Fuse Requirements for 100kA SCCR Compliance

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 13 : HGL Kit Customer Installed Line Fuse Requirements for 100kA SCCR Compliance

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

**Please review UL 508A SB4.1 in the context of the final filter design (any deviation from the TCI HarmonicGuard filter of similar rating) and Table 12 to confirm applicable SCCR for HGP kits and Table 13 for HGL kits.*

KPC capacitor kit KPCUL assemblies are listed as UL 508 assembles, and therefore do not carry an SCCR. The customer or installer shall provide UL required overcurrent protection upstream of filter.

Line Reactor

Recommendations and Considerations

When installing the KDR Line Reactors on the INPUT side of the VFD, please use the following guidelines when wiring the unit:

The KDR Line Reactor is a 3-phase device and should be wired in series and positioned on the input side of the VFD.

All Terminal Block connectors will be marked. A1, B1, and C1 are the input terminals where the 3 phases of incoming power are to be wired. The tap for the filter connection will be marked AT, BT, and CT. Output terminals will be marked A2, B2, and C2. Do not swap input and output terminals. Units with copper bus or ring lug terminals are not marked. Wiring from the output terminals should connect to the input of the VFD.

Refer to NEC (National Electrical Code) wiring practices for appropriate wire sizes for your application.

TCI recommends that these reactors be wired and located as close to the front end of the VFD as possible to have the greatest success in both protecting the VFD as well as mitigating line harmonics. We recommend this be 10 feet of cable or less.

Reactors generate a lot of heat in normal operations and their surfaces get very hot. In standard 40°C ambient or less installations, a clearance of 3 inches on all sides of the reactors and its enclosure is recommended for assisting in heat dissipation. This is a general guideline for typical applications. If the reactor is being installed next to a heat sensitive instrument or control device, we recommend reviewing specific requirements on heat limitations. Line reactor heat loss information is available on the web at Kits Page - TCI, LLC (transcoil.com)

These reactors are designed to be floor-mounted or wall-mounted. Large open-style devices should be panel mounted by incorporating a bracket that would act as a shelf to support the reactor and/or enclosure. When installing an open style device in an existing control cabinet, drive cabinet, motor control center, or other large enclosure, the reactor should be mounted in the lower half of the cabinet to prevent hot spots or pockets of heat. Locating the reactor in the lower half of the cabinet typically allows better thermal dissipation and heat convection. Reactors with ducts should be mounted vertically for proper cooling.

NOTE: *If the PQconnect PCB board is included in your kit please read through mounting and wiring practices found in* *Section 5.0*

Line Reactor Wiring

In the higher-performance HarmonicGuard Kit design, tapped line reactor wiring is more critical than standard line reactor designs. Before tapped line reactors, it did not matter if you connected the A1, B1, or C1 to the line side or the drive side, however, on all HarmonicGuard Kits, the terminals cannot be swapped. Incorrect wiring of the line reactor will result in poor harmonic mitigation and could damage the reactor. Consult the reactor drawing for your line reactor to verify proper filter wiring. All line reactor drawings are available on the parts web page: Kits Page - TCI, LLC (transcoil.com)

The incoming line must be wired to the winding start noted as A1, B1, and C1 in the reactor drawing. The tuned circuit is typically connected to the winding tap noted as AT, BT, and CT in the reactor drawing, or it may be connected to the winding end noted as A2, B2, and C2 in the reactor drawing.

In small line reactors with a nine-position terminal block, the terminal block is wired A1, AT, A2, B1, BT, B2, C1, CT, and C2 from left to right.

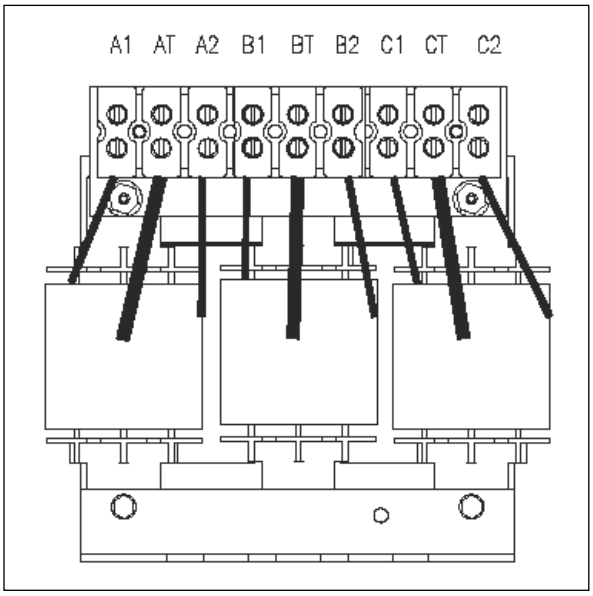


Figure 5 : Nine Position Terminal Block

In small line reactors with six position terminal blocks, the terminal block is wired A1, A2, B1, B2, C1, and C2 from left to right. The tap lugs AT, BT, and CT extend out from the front face of the coil.

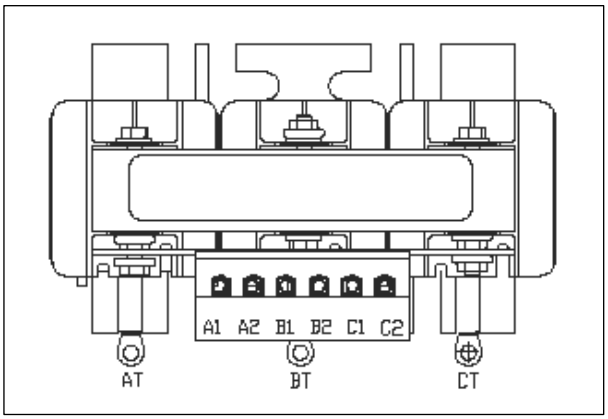


Figure 6 : Six Position Terminal Block

In line reactors where the current exceeds terminal block capability, ring lugs are used for all three terminations. Note from the drawing below, the tap connection is at the lower right side of the coil.

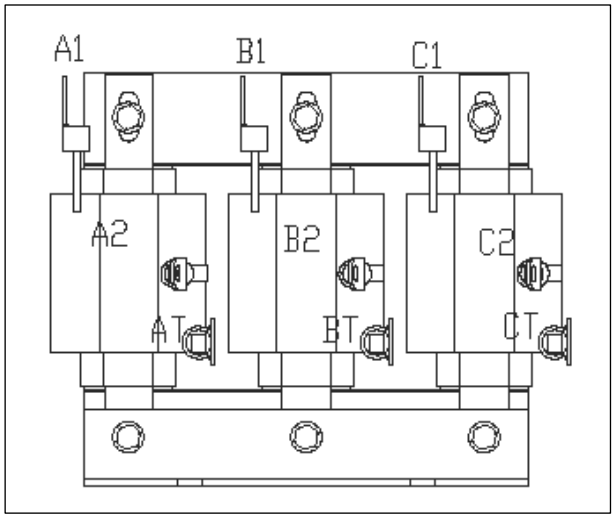


Figure 7 : Ring Lug Terminations

In larger line reactors, all three terminals extend from the front of the reactor and are constructed from copper bus bar terminals. Unless you are an expert on start and finish windings, consult the reactor drawing to be sure which terminal is which. In the example below, the tap winding is on the bottom of the coil.

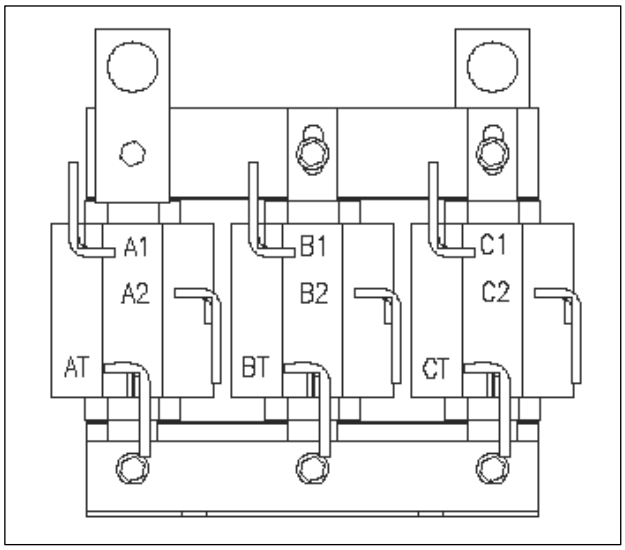


Figure 8 : Copper Flag Terminations

In the largest line reactors, the tap connection is off a winding that projects out from the front of the reactor.

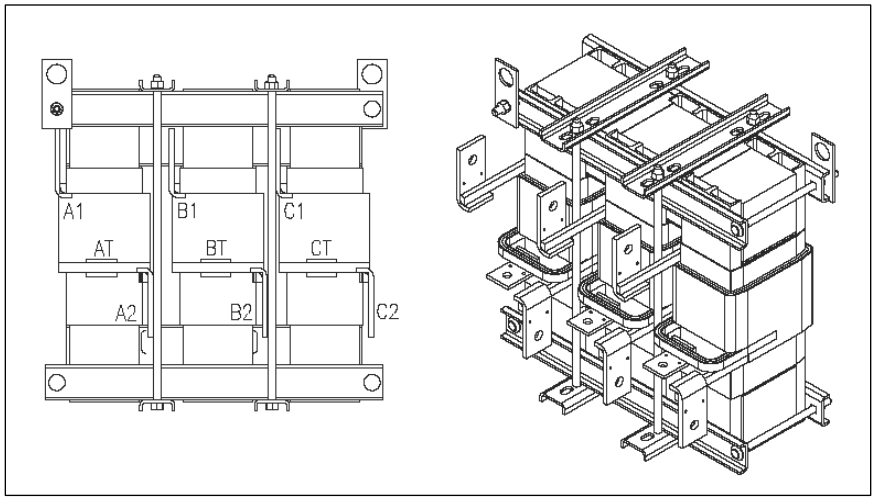


Figure 9 : In-Line Tap Termination

Tuning Reactor

The standard schematics above illustrate the normal configuration where the tuned circuit is connected to the line reactor tap. If high background voltage distortion is present, typically when the background voltage distortion exceeds 3% THD, the tuned circuit is connected to A2, B2, and C2 of the line reactor to improve harmonic performance under high background distortion conditions.

The tuning reactor supplied with the HarmonicGuard Kits has six terminals A1, A2, B1, B2, C1, and C2. If a consistent three terminals are used, the A1, B1, and C1 tuned reactor terminals or A2, B2, and C2 tuned reactor terminals can be connected to the line reactor tap at AT, BT, and CT.

Tuned Circuit Capacitors

The capacitors supplied in the HarmonicGuard Kits are intended to be connected in parallel with each other. Typically, these are three terminal three-phase capacitors with the internal capacitive elements connected in delta. Each capacitor has a bleeder resistor connected across the three input terminals to ensure voltage discharges in the time required by UL. Do not connect capacitors to power unless the bleeder resistors are connected, hazardous voltages will remain across the capacitors after the power has been disconnected.

As a check, the total kVAR of capacitors connected to the tuned reactor should match the part number of the reactor. For example, the HGP kit for a 480 V/100 HP contains two 15 kVAR capacitors for a total of 30 kVAR. These are wired in parallel to the tuning reactor, KTR30A65HG. While the HGL kit for a 480 V/200 HP contains three 10 kVAR capacitors for a total of 30 kVAR. These are wired in parallel to the tuning reactor, KTR30A65HL.

For the largest 480V HGP kits, there are two tuned circuits connected in parallel with each other. For example, the 480 V/100 HP HGP kit contains 300 kVAR of capacitors. One tuned reactor KTR150A65HG is wired to 150 kVAR of capacitors; the second tuned reactor KTR150A65HG is wired to the remaining 150 kVAR of capacitors.

Please note that the labeled capacitor kVAR is rated at 480V or 600 V. So, in cases where the voltage of the “kit” is different, such as 400 V, the kVAR of the capacitors will be different than what the label states. Frequency is also a consideration in the kVAR rating. This means that the kVAR of the KTR tuning reactor will be different from the total capacitance of all capacitors included in the kit. This is normal. The small horsepower kits, 480 V/1.5 HP through 480 V/10 HP and 600V/5 HP through 600 V/10 HP are supplied with single-phase capacitors for each filter. These capacitors are connected in wye, and the bleeder resistors are connected across the terminals of each capacitor.

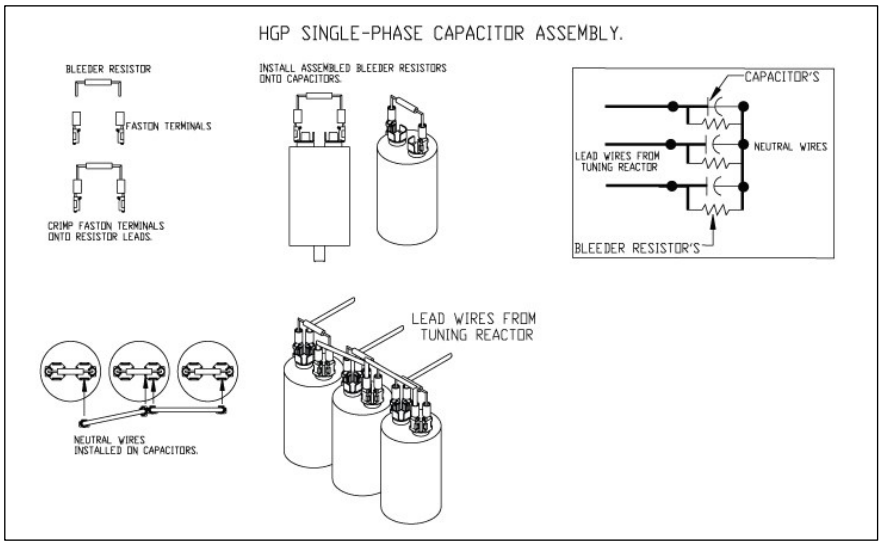


Figure 10 : Bleeder Resistor Installation and Wiring for Single-Phase

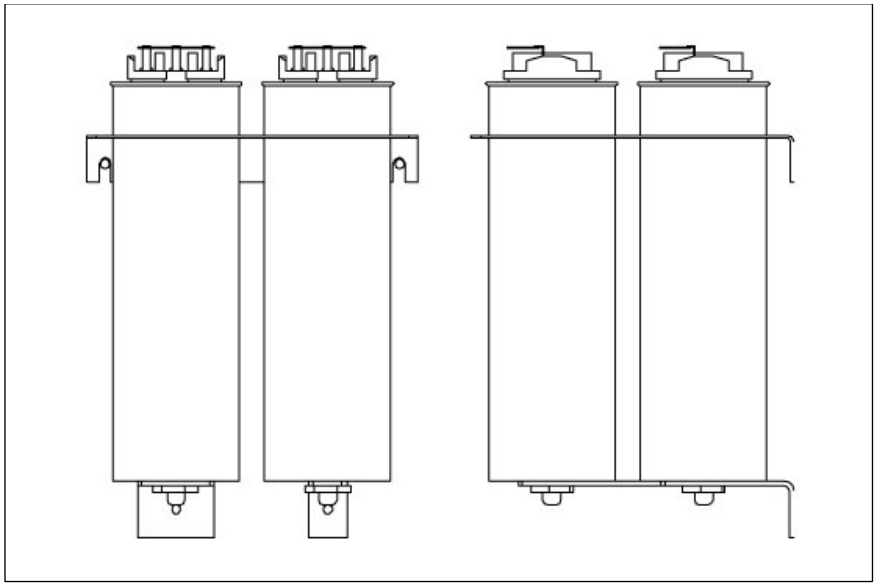


Figure 11 : Capacitors and Brackets

Capacitor brackets supplied with the HarmonicGuard CP Kits mount the capacitors from a right-angle bracket using the studs on the bottom of the capacitors. The bracket surrounding the capacitors is mounted near the top of the capacitor can. Rubber grommet material is placed around the large diameter holes to prevent the edges of the bracket damaging the capacitor cans. This hole does not firmly clamp the capacitors and is not intended to do so: such a design would prevent the internal

capacitor pressure disconnection means from operating. This bracket prevents gross motion of the capacitors during shipping vibration which could fracture the mounting bracket or allow the capacitors to hit other components.

Contactor (Customer Supplied)

Your panels may include contactors to remove the tuned circuit from the filter under no load or light load conditions. If not select contactor size based on the contactor UL general purpose current rating to handle 110% of the tuned circuit current from the tables above. The impedance of the line and tuning reactors removes the need for special capacitor rated contactors in this application.

Fuse (HGL Kit Only - Customer Supplied)

Your panels may include fuses in the tuned circuit. These can be selected based on the tuned circuit current from the tables above. Depending upon the application requirements, fuses may be needed to support HIGH SCCR, and fuse value/speed will also depend upon the application requirements.

Contact TCI Technical Support or visit Transcoil's Support Page for additional information.

Over-temperature/Thermal Switch (Option)

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.

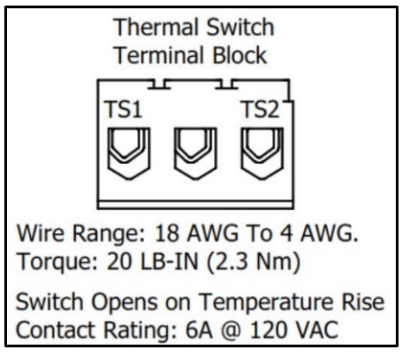


Figure 12 : Terminal Block

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.

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/**

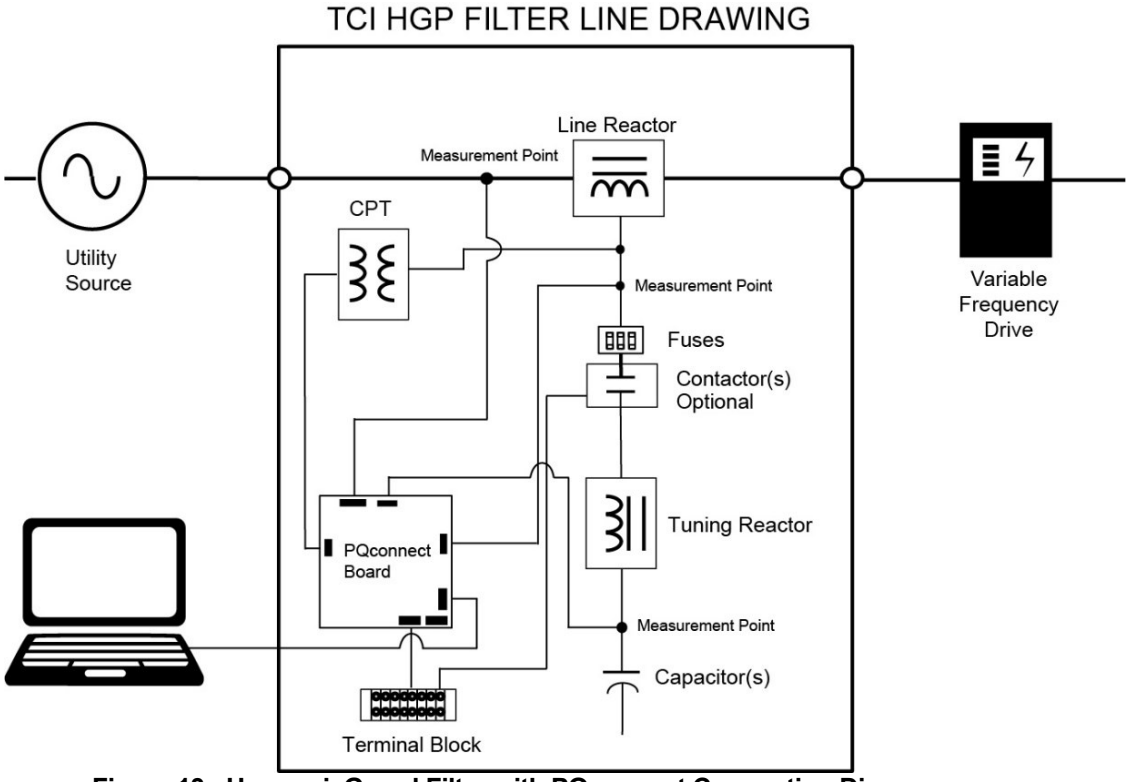


Figure 13 : HarmonicGuard Filter with PQconnect Connection Diagram

Mounting

Selecting a Suitable Location

When mounting the PQconnect board, provide an adequately ventilated location to prevent overheating. Refer to the applicable kit drawings for PCB dimensions. The maximum temperature of the air around the HGP filter components should not exceed 50°C (122°F). Consult the watts loss columns above in Filter Wire Sizing for Watts Loss when planning enclosure ventilation. When selecting a mounting location for the PQconnect PCB, plan for the routing of the power wiring. The figure below shows a representative schematic of power wiring. Note that there are direct connections from the KDR line reactor to the PQconnect PCB.

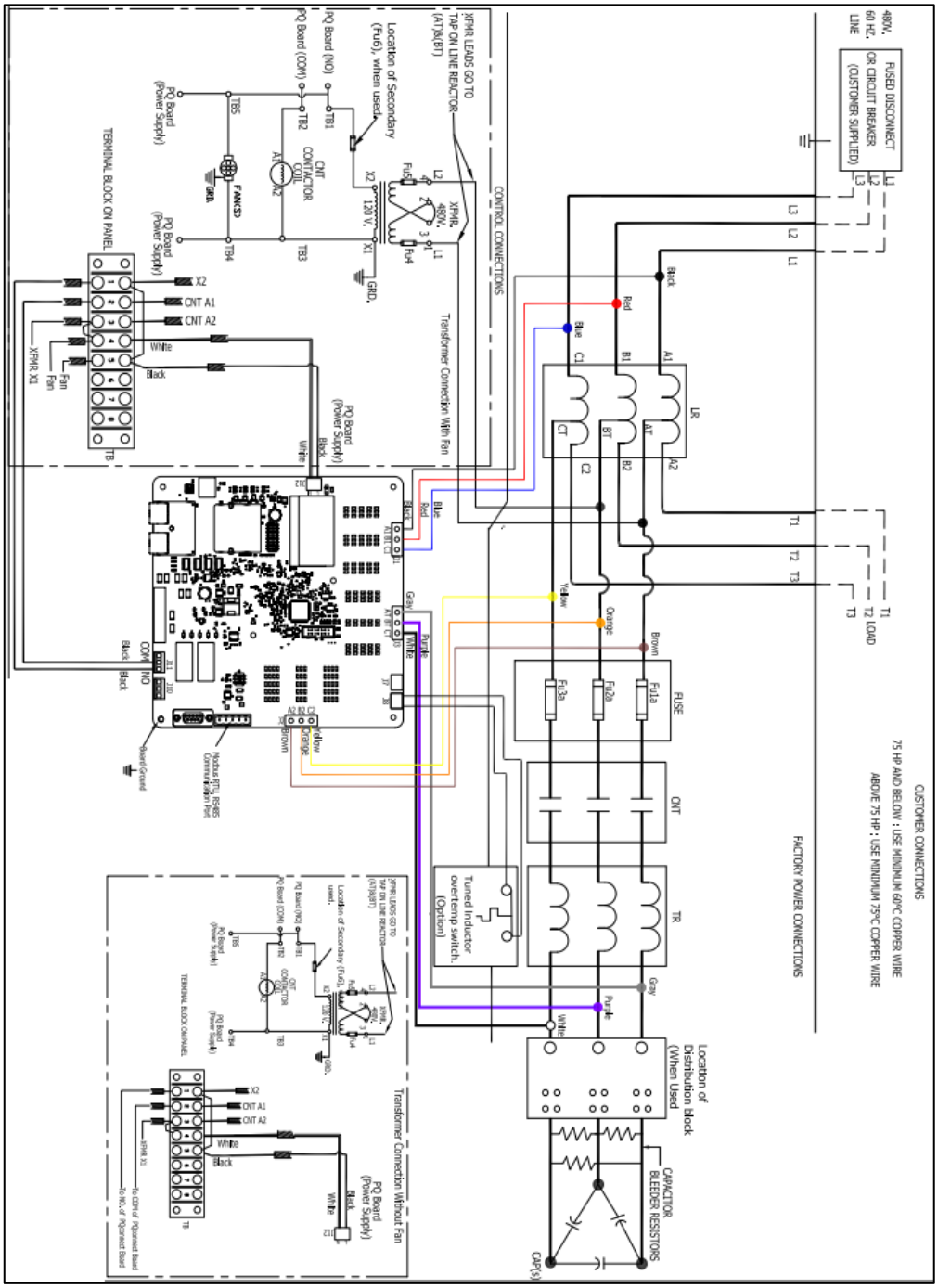


Figure 14 : Typical Filter Wiring with PQconnect PCB

Mounting Hardware

Figure 15 below shows the standoffs and screws provided with the kits to mount the board on the bracket.

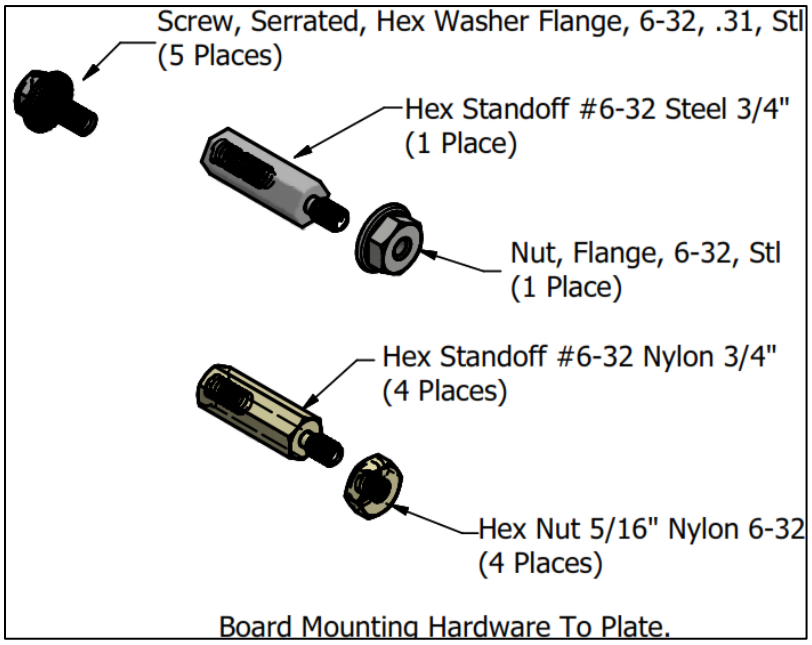


Figure 15 : PQconnect PCB Mounting Hardware

Reference Drawing **PKPQ5** for complete board mounting with the bracket.

When mounting the bracket into the enclosure there are three guidelines to follow.

1. Determine the best location where there is adequate ventilation, depth for components, and cables; away from any heat source.

2. The inside surface of the enclosure must be free of protrusions or obstructions in the area where the PQconnect board will rest.

3. Drill holes as needed per dimension provided.

To ensure the board has a solid ground connection. The metal stud and nut provided with the kit will need to be installed onto the grounding pad of the board. Figure 14 below indicates the location of the ground connection.

Communication Options and Connections

When selecting a mounting location for the PQconnect PCB, plan for the routing of the power wiring. Make sure all wiring conforms to the requirements of the NEC electrical codes and can handle the max current required.

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 16: PQconnect Connections. The details of the power and communications terminals are shown in Table 14 : Power & Communications Terminals. Form C relays are available on the PCB, these connections are shown in Table 16 : Form C Relay Contacts/Customer Inputs/Outputs.

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.

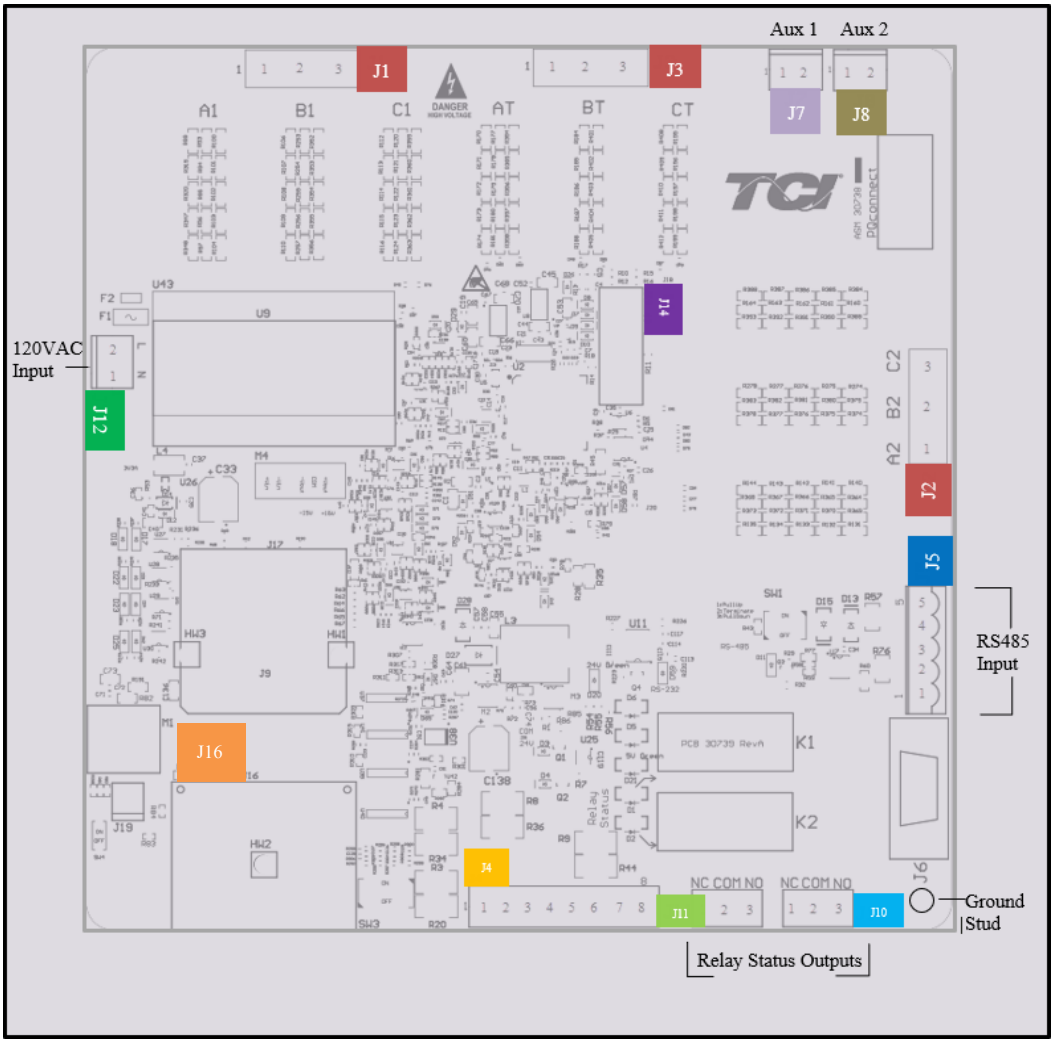


Figure 16: PQconnect Connections

Table 14 : Power & Communications Terminals

Terminal	PCB Pin Connections	Reactor Connections	Description	Label	Rating
J1	A1	A1 (KDR)	Voltage Sense leads leading from J1 to the **Line Reactor Input**	Phase A	600 VAC
	B1	B1 (KDR)		Phase B	
	C1	C1 (KDR)		Phase C	
J2	A2	AT (KDR)	Voltage Sense leads leading from J2 to the **Line Reactor Tap**	Phase A	
	B2	BT (KDR)		Phase B	
	C2	CT (KDR)		Phase C	
J3	A3	KTR Output A	Voltage Sense leads leading from J3 to the **Tuning Reactor Output**	Phase A	
	B3	KTR Output B		Phase B	
	C3	KTR Output C		Phase C	
J4	1,2,3,4	N/A	Not Connected		N/A
	5,6,7,8		Current transformer connections	Only used for filters with dual tuned circuits	N/A
J5	1		RS485	Not Connected	N/A
	2			A (D-)	
	3			Ground	
	4			B (D+)	
	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	N/A	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). **For further detail of connections, view HGP schematic 29597-PQ2.

Depending on the size of the line reactor, you have the option of different terminations based on the reactor. Table 15 : Voltage Sense Wire Termination, provides examples of the terminations used for the voltage sense wires from the PQconnect to the line reactor. All recommendations are used with 18 AWG stranded wire.

Table 15 : Voltage Sense Wire Termination

Connector Termination	Manufacturer Part Number	Manufacturer	Description	KDR Line Reactor Size
Metal tab	43178-4002	Molex, LLC	Blade Contact 18-20 AWG Crimp Male Blade	Small line reactors with six or nine position terminal blocks. Reference Figures 4 and 5
3/8” Ring Lug	2-320573-4	TE Connectivity Amp Connectors	Ring Terminal Connector	Large line reactors with copper bus bar terminals Reference Figures 6, 7 and 8
1/4” Ring Lug	2-31894-2	TE Connectivity Amp Connectors		
1/2” Ring Lug	61863-2	Tyco Electronics		

***Note:** Voltage sense wire terminals J1, J2 & J3 accept wire gauges of 16-28 AWG with a tightening torque of 4.4 in-lb (0.5 Nm). Alternate/Equivalent tabs and ring lugs may be used for terminations. Please consult with TCI Tech-Support if there are any questions for alternate parts or for reactor termination.*

Table 16 : Form C Relay Contacts/Customer Inputs/Outputs

Terminal	Pin	Description	Label	Tightening Torque	Wire Range
J7	1,2	Multi-functional digital Input 1	Customer contact, normally open	3.5 lb-in (0.4 Nm)	28-12 AWG
J8	1,2	Multi-functional digital Input 1	Customer contact, normally open	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.

If you have purchased a filter with the EtherNet/IP option but your PQconnect board does not have the EtherNet/IP B40 Module and its software Rev is below C1.0 plus notify TCI or your vendor.

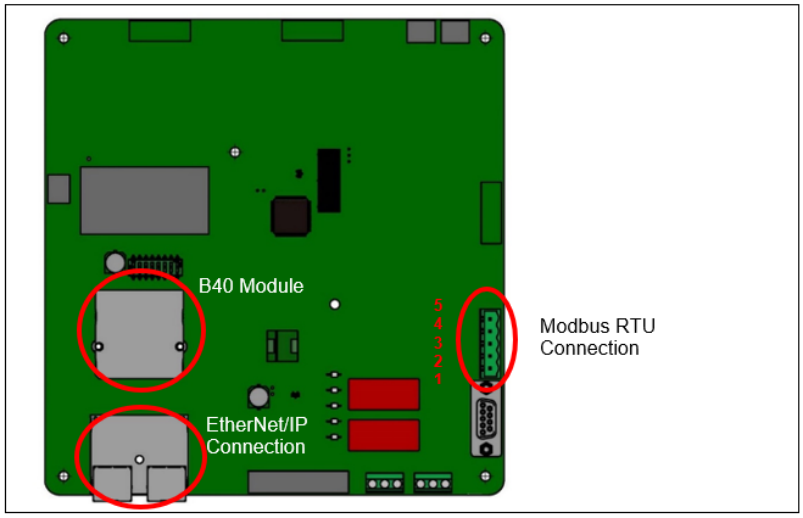


Figure 17 : PQconnect Modbus RTU Connection and Optional EtherNet/IP

The hardware pinout header and default protocol settings are shown below for Modbus and EtherNet/IP communication.

Table 17 : 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 18 : 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	-

Table 19 : 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 20 : EtherNet/IP Protocol Settings

Setting	Default Value
IP Address	192.168.1.35
Gateway	0.0.0.0
Subnet	255.255.255.0
DCHP	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 filter. The PQconnect PC application (PQvision) accesses a ModbusRTU master device for the network interface (see the PQvision application display connections).

Table 21 : 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).*

PQconnect PCB Calibration

Once the PQconnect connections are made the PCB must be calibrated to the HGP filter components to ensure proper accuracy and operation of the completed filter. The following steps will allow for units to be properly calibrated.

Note: *Instillation of the PQvision desktop interface is required for calibration. Please see next section "PQvision Software" before proceeding with PCB calibration. You can download the free PQvision software.*

Equipment: *Calibrated current clamp meter, laptop, RS485 to USB converter*

Step 1: After assembling HGP with PQconnect, ground the filter and install **only the line side connections** to the appropriate phases first. **Do not install the load side connections for calibration process**.

Ensure communication connections and voltage sense wires are made, follow Table 14 : Power & Communications Terminals for further detail.

Step 2: Energize the harmonic filter.

Step 3: Open PQvision interface and connect to a communication port.

- A "CONNECTED" message will appear verifying that the RS485 converter is connected to the board.
- If there are any difficulties communicating with the desktop interface, a "NO COM" message will appear. Refer to the 6.0 PQconnect Troubleshooting for possible solutions.

Note*: If desktop interface does not show the com port, disengage power from filter and check wiring to the RS485 converter.*

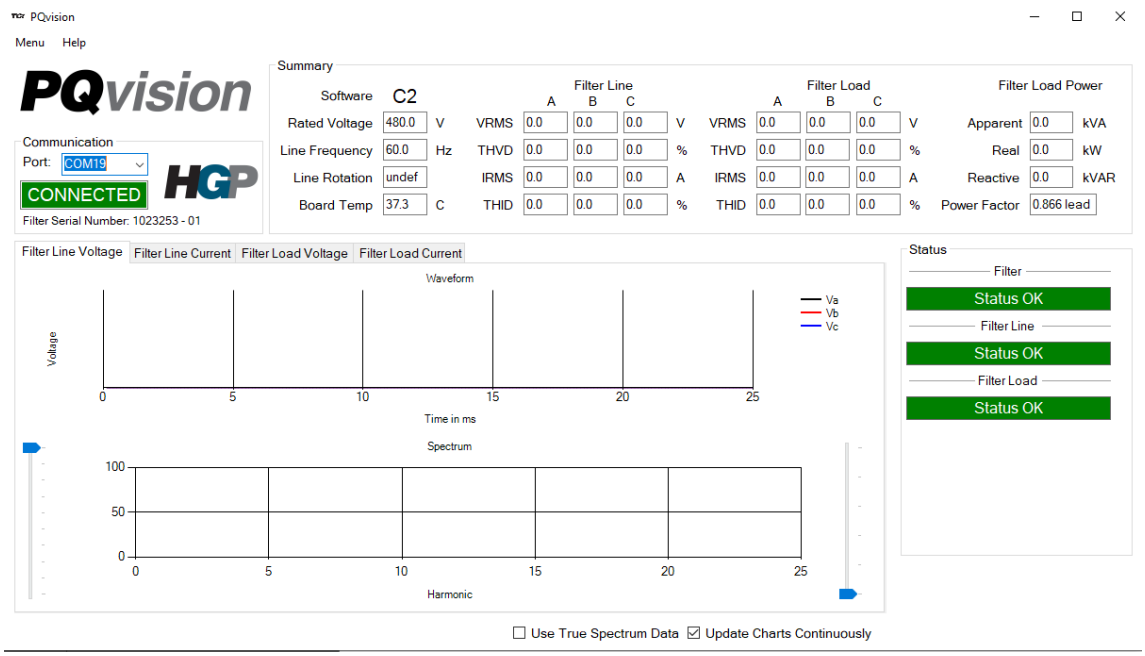


Figure 18 : Communication Port (COM port)

Step 4: Select **Menu** and **Settings** (Tech level access is required) as shown below.

- Password **08252014**

Figure 19 : Settings Selection

Step 5: Select **Menu** and **Calibrate**

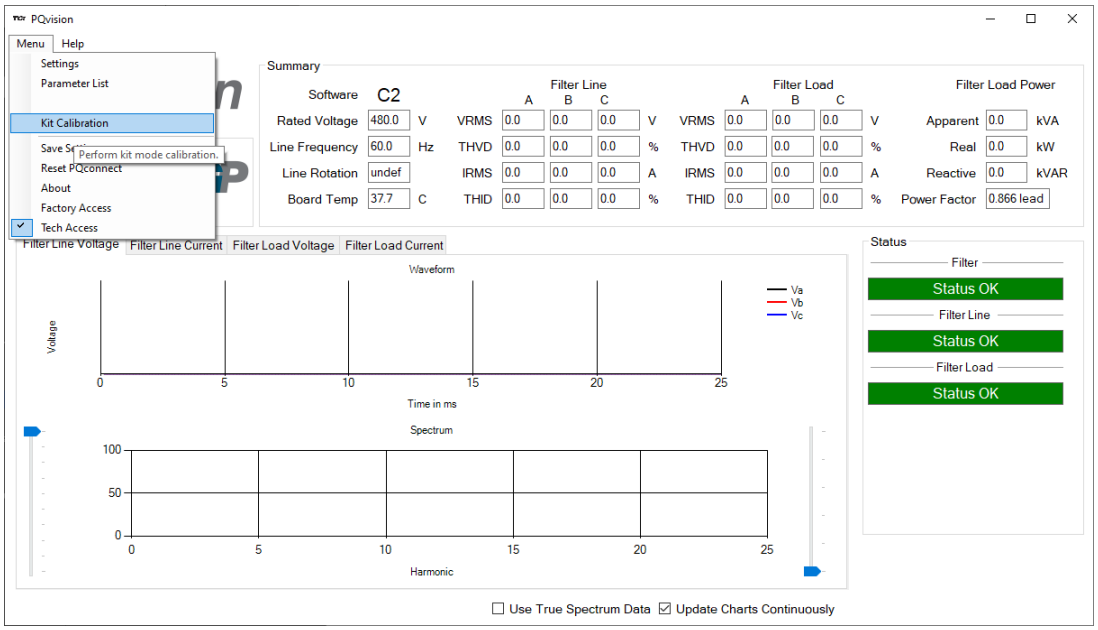


Figure 20 : Kit Calibration Selection

Step 7: Follow through the Steps shown on the calibration screen shown below.

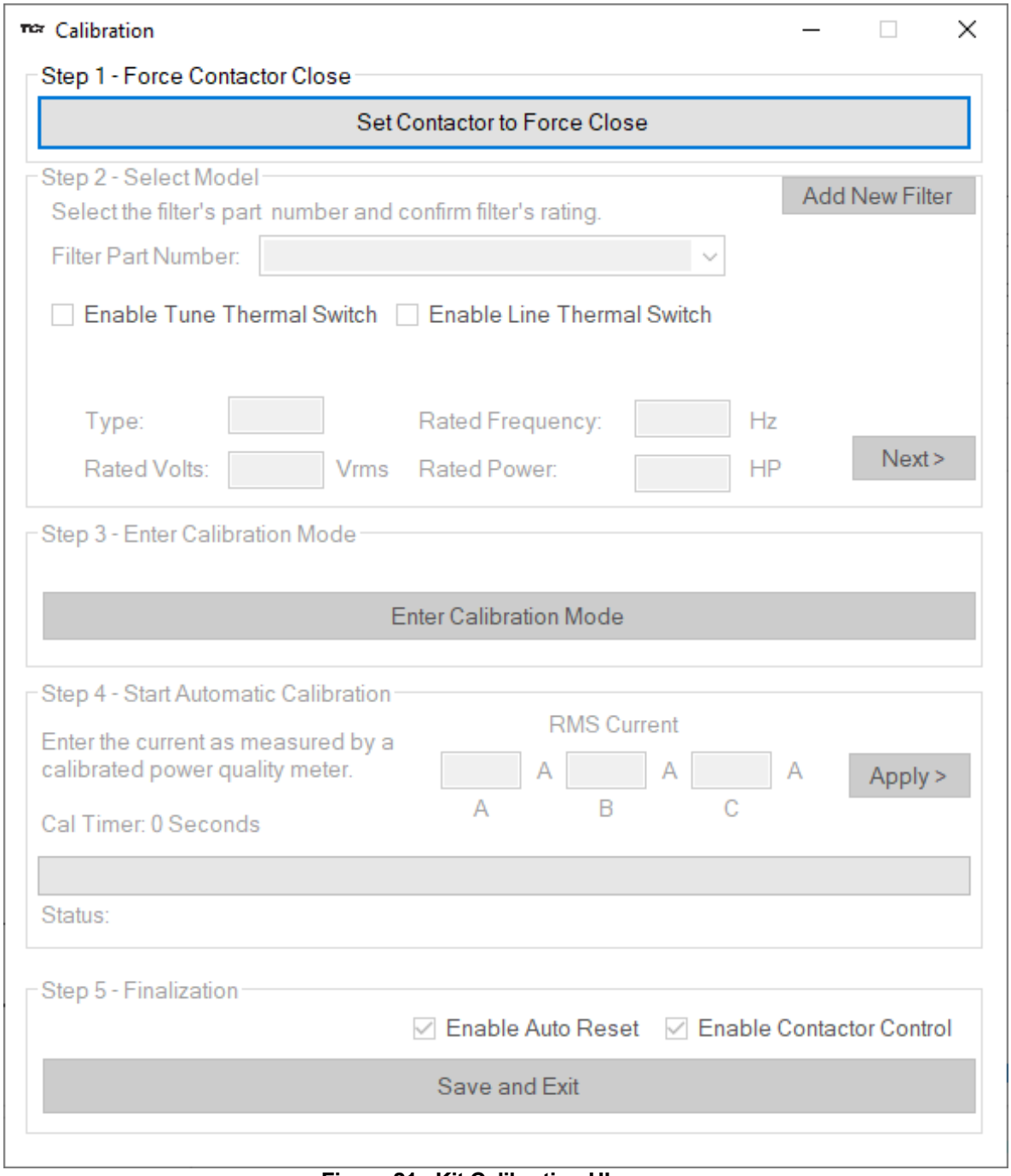


Figure 21 : Kit Calibration UI

Step 1: Click on Force Contactor Close

Step 2: Select the filter's part number by typing in the part number or selecting it from the combo box.

- Only the first 9 characters of the filters part number need to be entered.
- For example: 250HP 480V 60Hz HGP; unit model number **HGP0250AW** would be acceptable.
- If the filter is not found select the "Add New Filter" button shown in the figure below and contact TCI

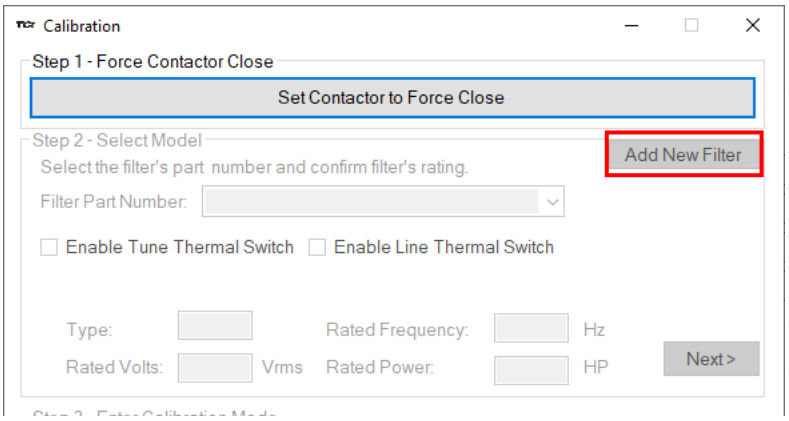


Figure 22 : Add New Filter Button

- This will require a password. Enter Password: **03012024**
- Enter the provided text file that TCI has emailed or sent for your filter; if you have not received a text file from TCI, reach out to TCI-Technical Support at *414-357-4541*
- After successfully selection, a "Filter Summary" window will be displayed to verify your filter information type, voltage, frequency, and power rating. If the displayed information differs from the nameplate or the filter that has been ordered, contact TCI-Technical Support immediately.

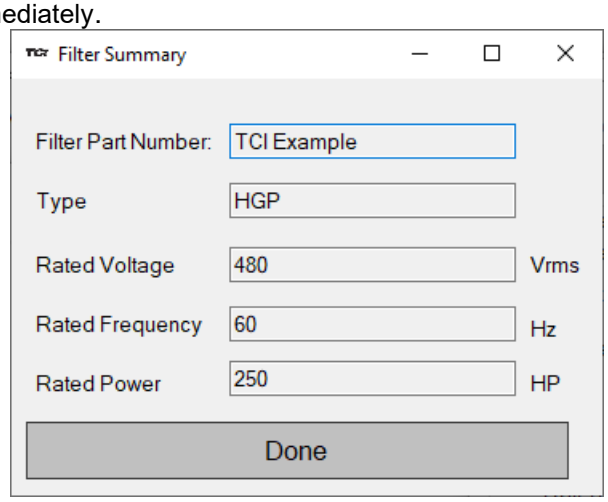


Figure 23 : Filter Summary

- Select **Done**, the added filter will be preselected as an option and will be an option that will exist in your PQvision application.

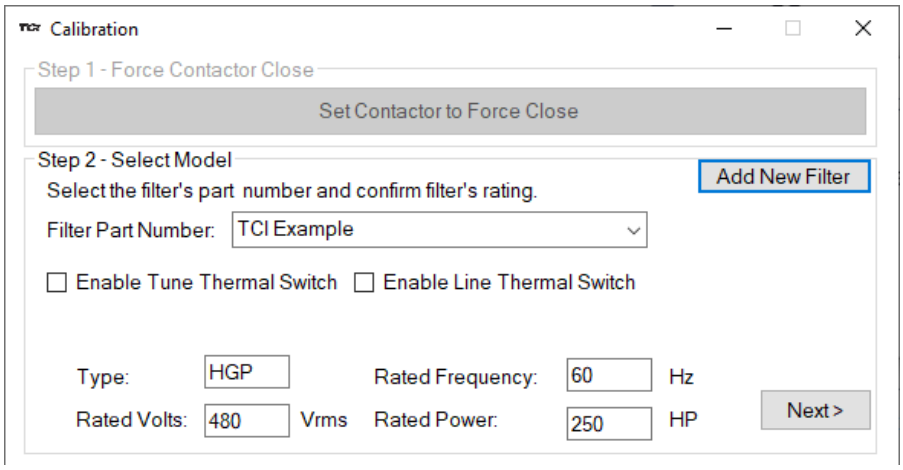


Figure 24 : Example of New Filter Selection

Verify your model number.

- Filter information (Voltage, frequency, Horsepower, Type) will show after the model number has been selected.

Figure 25 : Filter Information

- Select **Next**.

Step 3: Click Calibration Mode

- Note: If there is a problem with the board it will not enter calibration mode
- Contact Tech-Support if the board does not enter the calibration state.

Step 4: Enter Current Measurements

- With a current clamp meter measure each individual phase from the input of the filter afterwards select apply. *Calibration process will not continue unless fields are written.*
- Select Apply. *May take up 1-2 minutes to complete.*

Step 5: Finalization

- For Units with contactor control, select the “Enable contactor Control” and “Enable Auto Reset”. Deselect these options for units without a contactor.
- Save and exit after completed.

Step 8: Final connections

- Disengage power from the filter after the calibration steps are complete, proceed with connecting the load side connections of the filter.
- If a PLC is being used make sure to make these connections to the Modbus header of the PCB
- Re-energize filter.

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 17 : Modbus Connector Pin Definitions the USB connector will need to run to a laptop or PC.

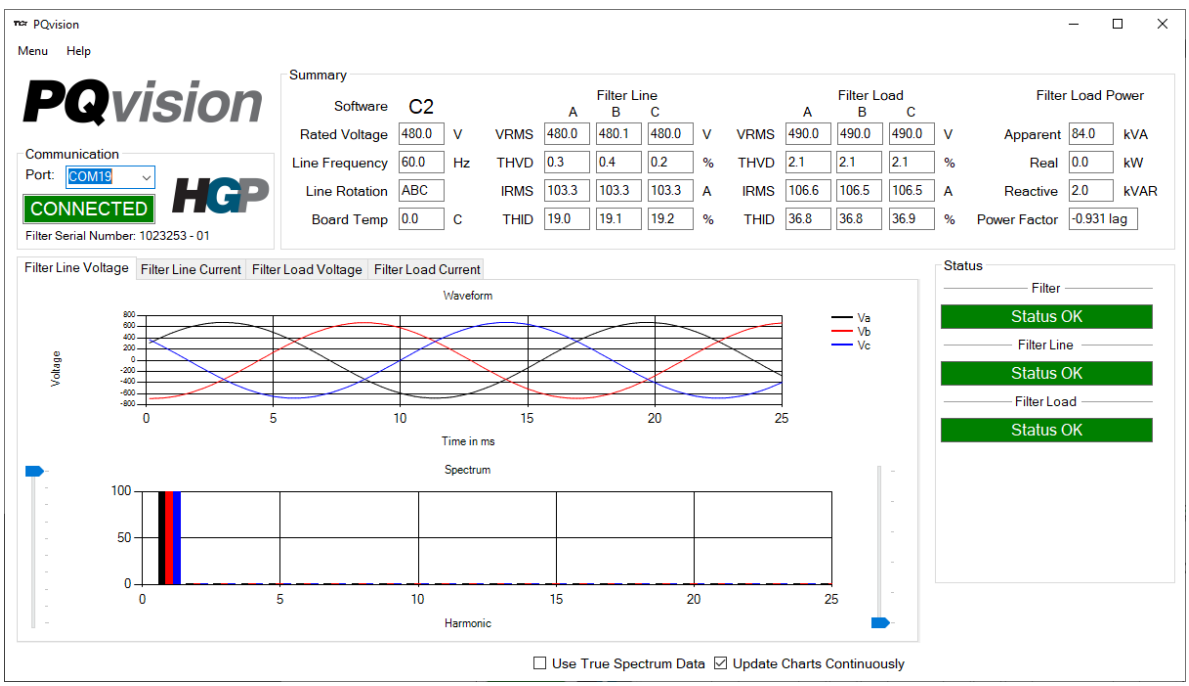


Figure 26 : PQvision Desktop Application

Table 22 : 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 17 : 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
	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.

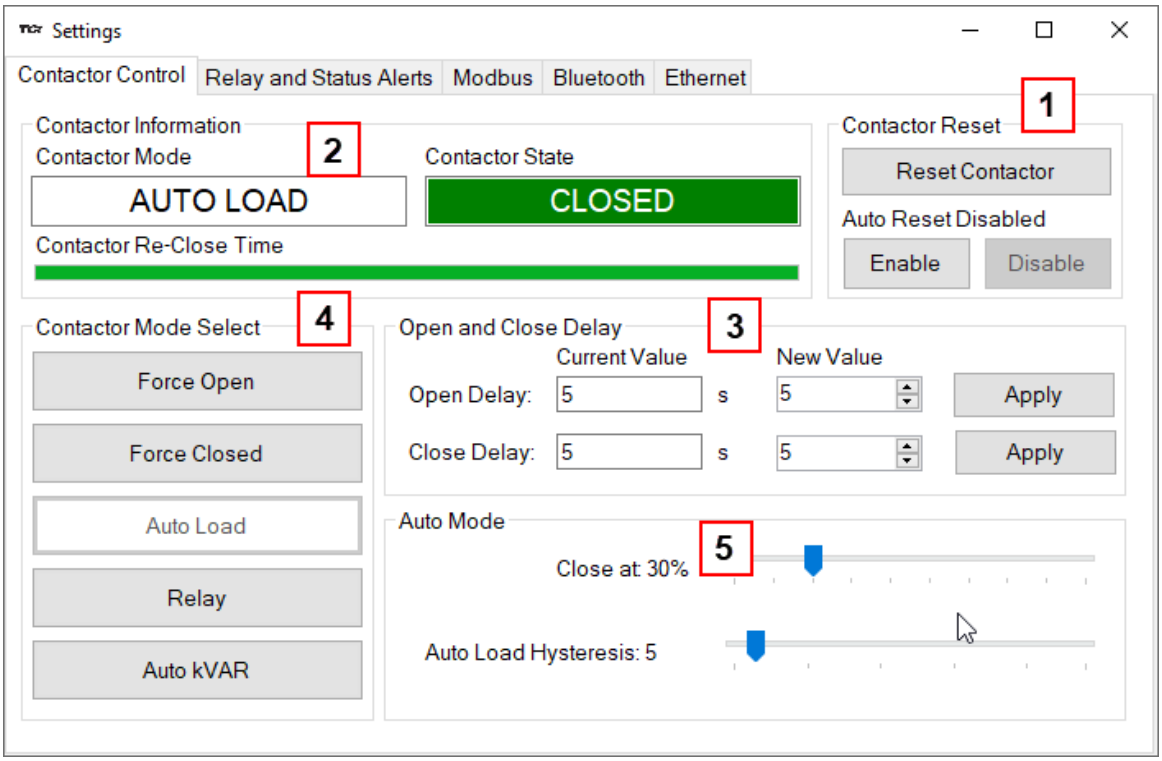


Figure 27 : Contactor Control Settings Menu

Table 23 : 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**	There are multiple ways to control the contactor. 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. **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. Example in figure above the user can close the contactor between 10-100% load.

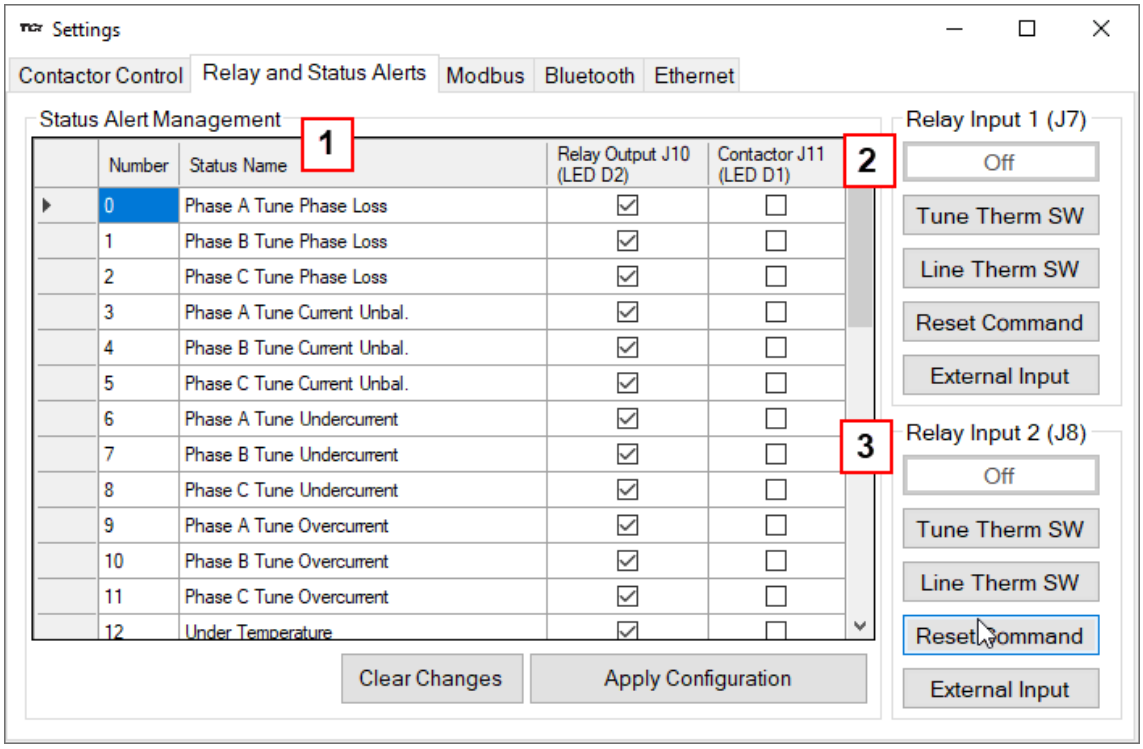


Figure 28: Relay and Status Settings Menu

Table 24: 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.

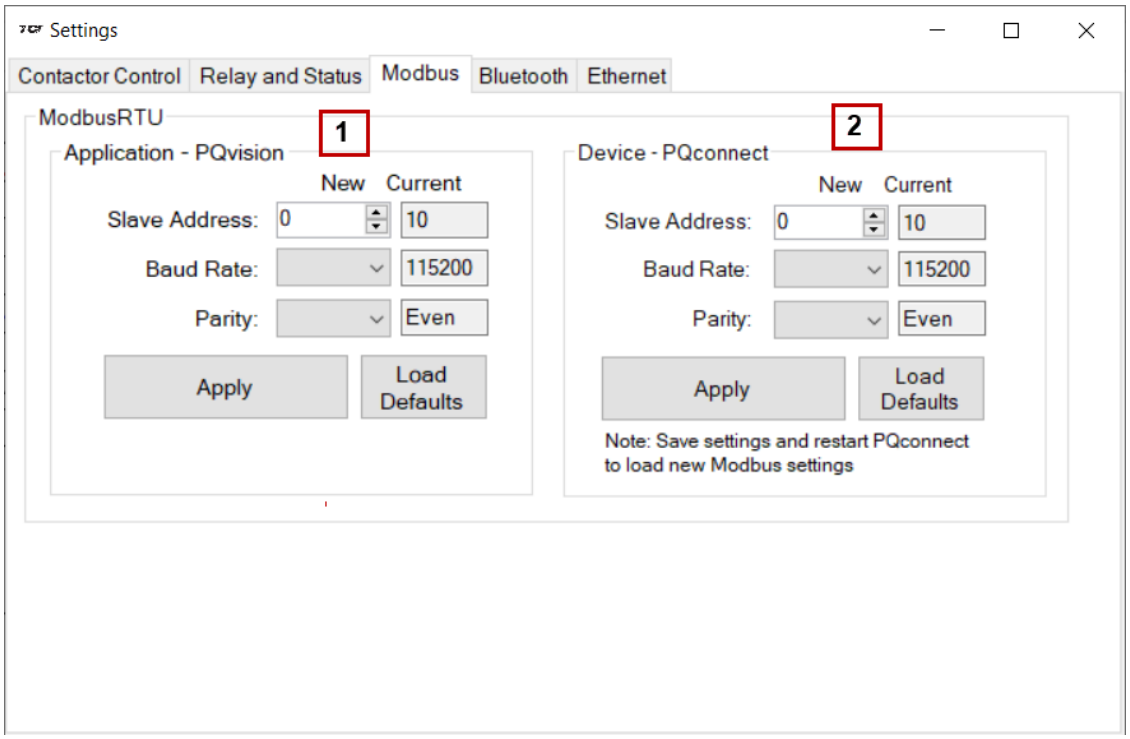


Figure 29: Modbus Settings Menu

Table 25: 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.**

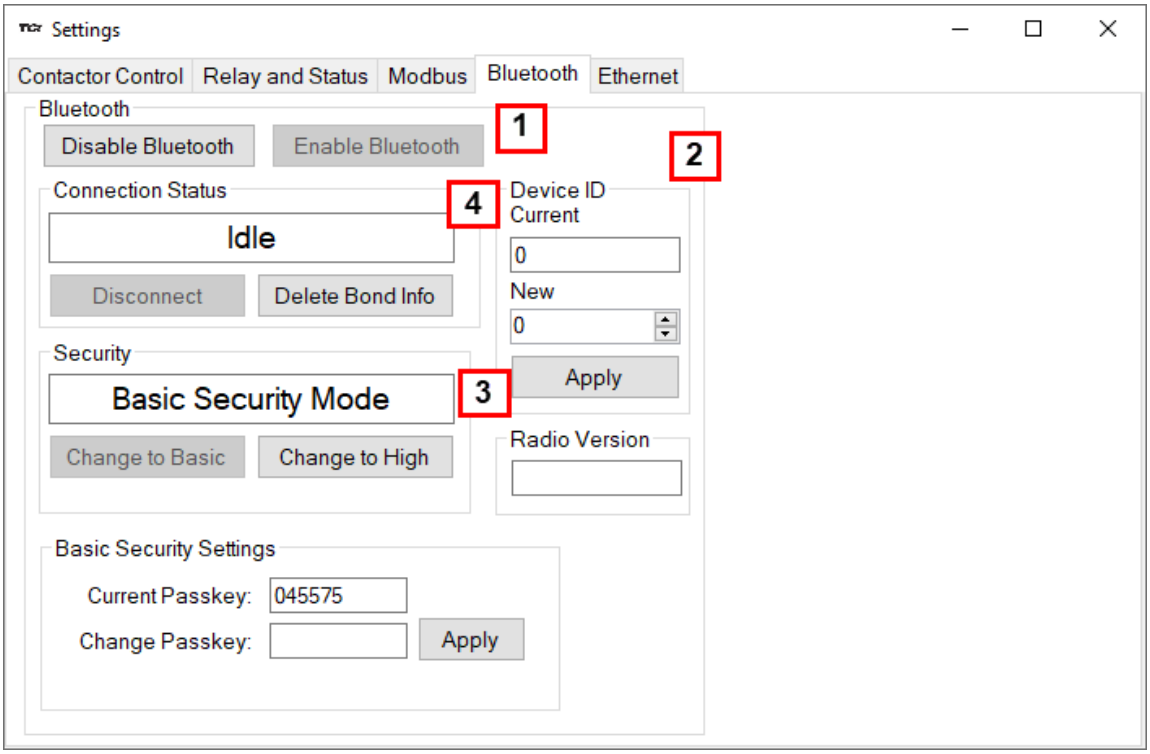


Figure 30: Bluetooth Settings Menu

Table 26: 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. Make sure to Save settings after making all selections on your PQconnect board.
2.	**Device ID**	Bluetooth numeric identifier, this numeric identifier allows PQvision mobile to identify different PQconect boards within a 100-ft range. Please change the numeric ID to a unique numeric ID from a value of 0-9999.
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. Save settings after making all selections
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.

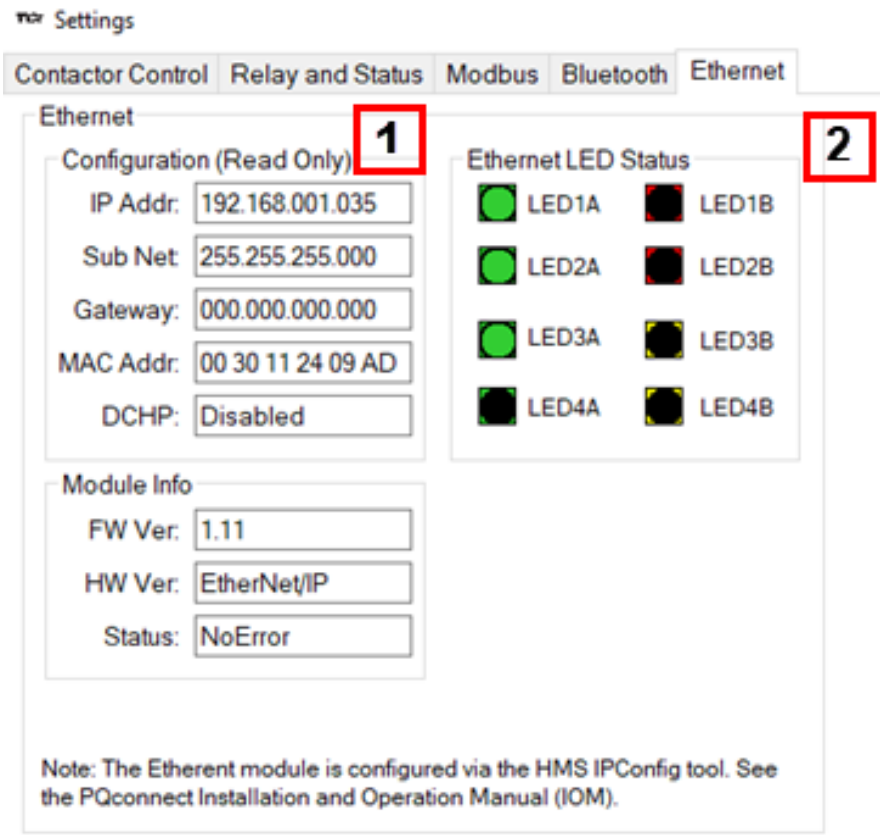
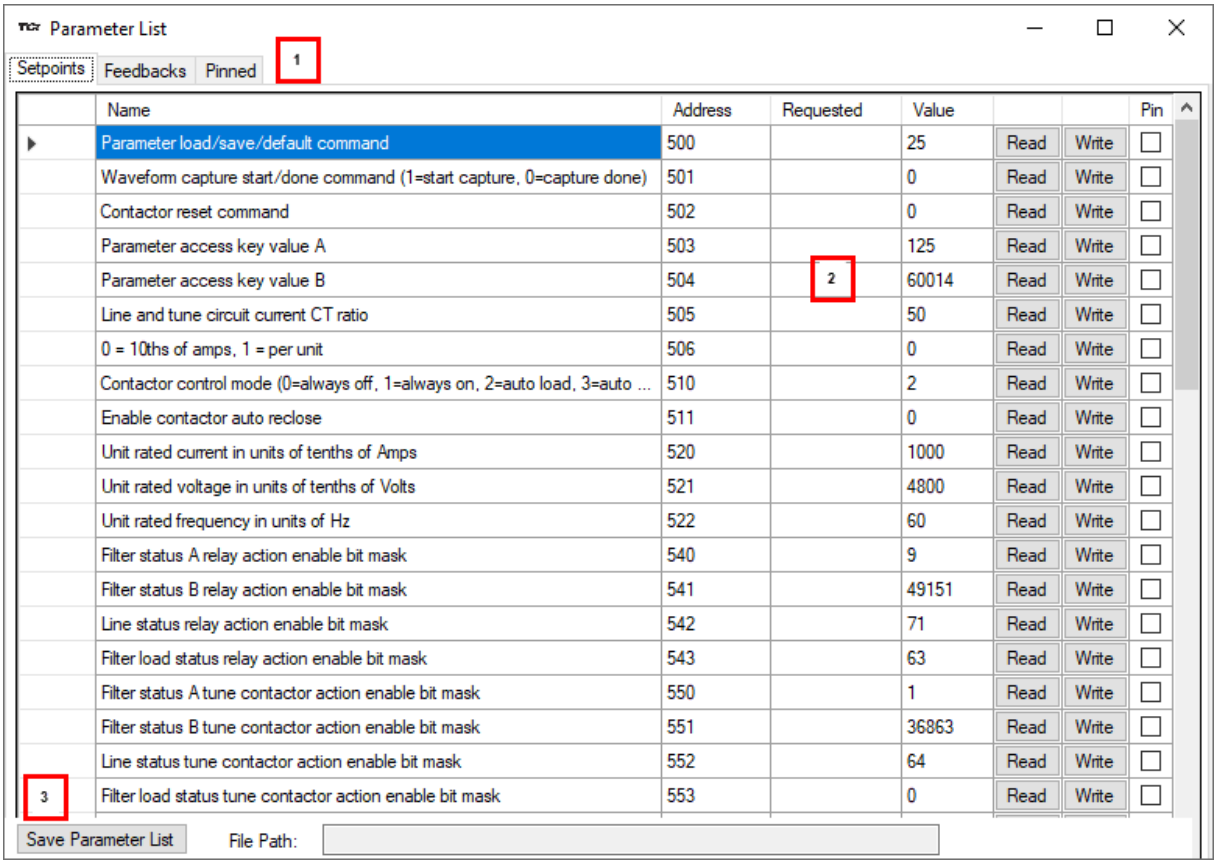


Figure 31: EtherNet/IP Settings Menu

Table 27 : EtherNet/IP Settings Menu

Designators	Name	Description
1.	**Configuration**	**Read Only** EtherNet/IP Configuration information about the PQconnect board. DCHP 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 Table 62 : PQconnect LED Codes for more information.

For more information review sections 6.0 PQconnect Troubleshooting.



	Name	Address	Requested	Value			Pin
	Parameter load/save/default command	500		25	Read	Write	☐
	Waveform capture start/done command (1=start capture, 0=capture done)	501		0	Read	Write	☐
	Contactor reset command	502		0	Read	Write	☐
	Parameter access key value A	503		125	Read	Write	☐
	Parameter access key value B	504		60014	Read	Write	☐
	Line and tune circuit current CT ratio	505		50	Read	Write	☐
	0 = 10ths of amps, 1 = per unit	506		0	Read	Write	☐
	Contactor control mode (0=always off, 1=always on, 2=auto load, 3=auto ...	510		2	Read	Write	☐
	Enable contactor auto reclose	511		0	Read	Write	☐
	Unit rated current in units of tenths of Amps	520		1000	Read	Write	☐
	Unit rated voltage in units of tenths of Volts	521		4800	Read	Write	☐
	Unit rated frequency in units of Hz	522		60	Read	Write	☐
	Filter status A relay action enable bit mask	540		9	Read	Write	☐
	Filter status B relay action enable bit mask	541		49151	Read	Write	☐
	Line status relay action enable bit mask	542		71	Read	Write	☐
	Filter load status relay action enable bit mask	543		63	Read	Write	☐
	Filter status A tune contactor action enable bit mask	550		1	Read	Write	☐
	Filter status B tune contactor action enable bit mask	551		36863	Read	Write	☐
	Line status tune contactor action enable bit mask	552		64	Read	Write	☐
	Filter load status tune contactor action enable bit mask	553		0	Read	Write	☐

Figure 32: Parameter List

Table 28: Parameter List

Designators	Name	Description
	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.
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. For information on each of the setpoints, see the Register Map section below, starting with Setpoints Register Map.
3.	**Parameter List Save to Text File**	The parameters can be saved to a comma separated text file (.csv) by clicking the **Save Parameter List** button. Upon clicking this, a file dialog browser will appear, prompting the user to select a file location for the .csv file to be saved to.

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 33: 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 29: 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.

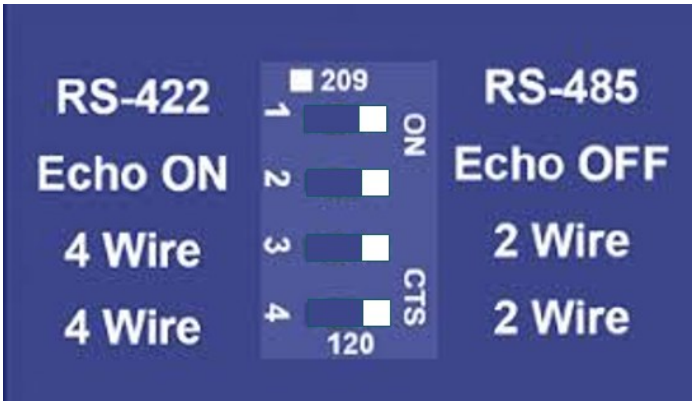


Figure 34: Dip Switch settings.

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

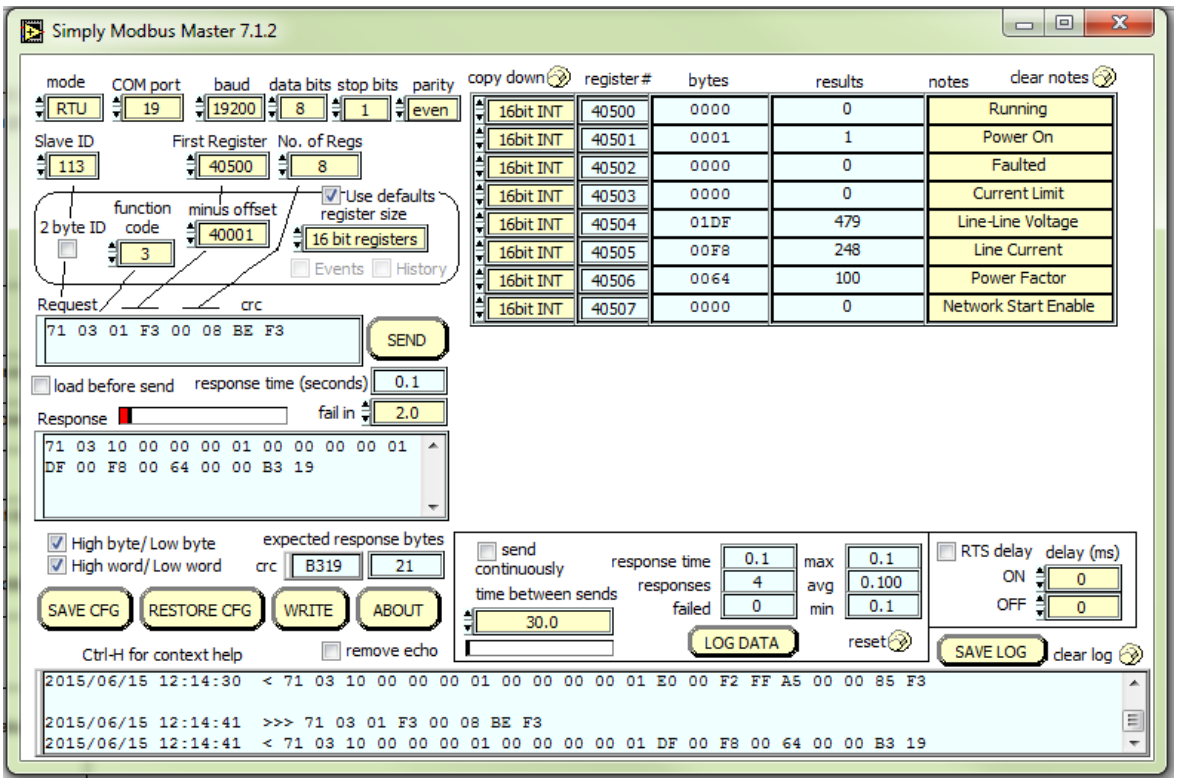


Figure 35: Example Setup Instructions to Write Data to the PQconnect Unit

- 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.

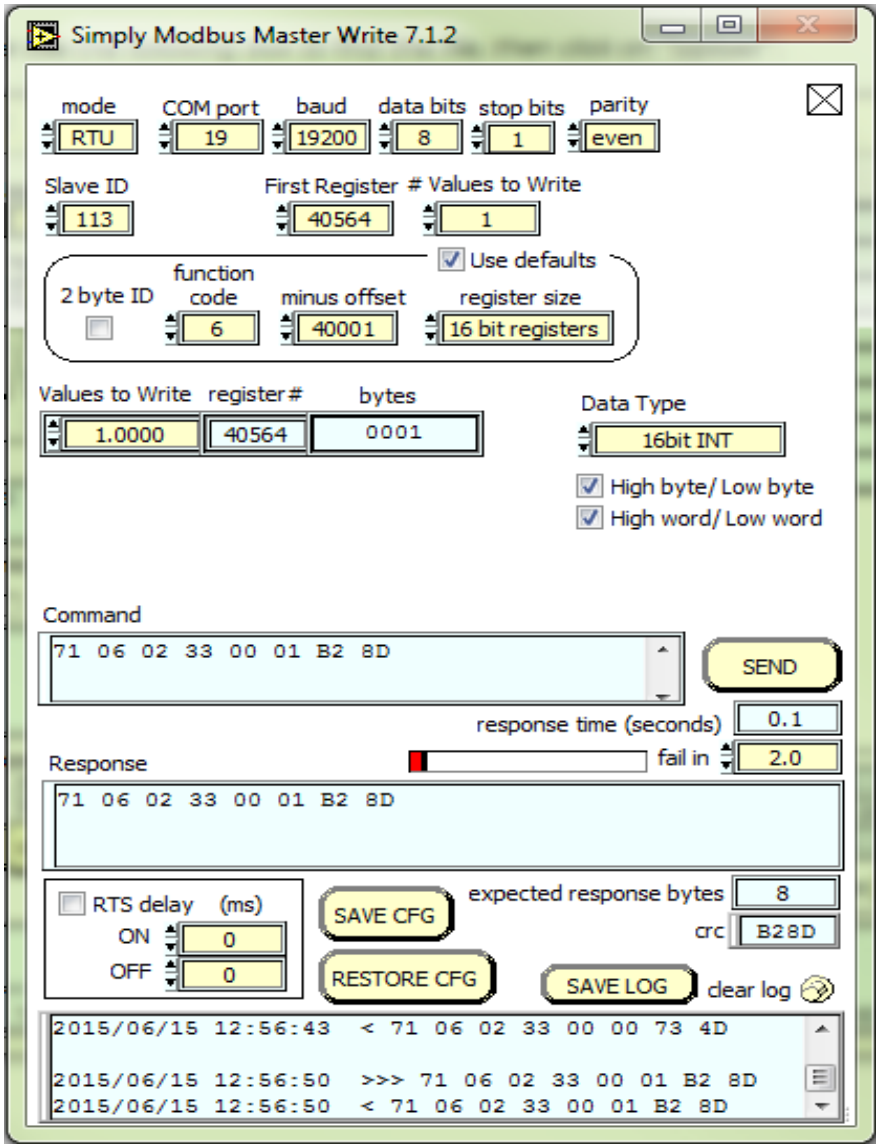


Figure 36: WRITE Screen

- 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 29: 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 9 = Save Current Values to Flash 21 = Set User Access 25 = Set Access to Tech Access **(access key needs to be set to 125 for key A and 60014 for key B)** 100 = Clear History Log 150 = Load Values from Flash 200 = Restore Defaults to Flash 300 = Restore Calibration Defaults
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 = Undef 3 = Sim 101 = HSD 102 = HGL 103 = HGP 104 = HSL 200 = KIT
HMS_SW_VER	14	Fieldbus communications processor firmware version	EtherNet Module Model Number
HMS_MODEL_NUM_RO	15	Fieldbus communications processor model number	Software Revision code for the Bluetooth module Two 8bit ASCII Characters 0x0141 = ASCII for “A1”
BGM_SW_VER	16	Wireless communications firmware version	
BGM_MODEL_NUM_RO	17	Wireless communications firmware model number	
LINE_VOLTAGE	20	Configured utility grid voltage, (10 = 1.0 Volts)	Filter Input Voltage
LINE_FREQ	21	Utility grid frequency, (10 = 1.0 Hz)	Filter Input Frequency
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	
V_LINE_AB_RMS	30	Line voltage phase AB RMS, (10 = 1.0 Volts)	Source Utility Line Phase to Phase Voltage (A-B) Range: 0 to 1000 Vrms

V_LINE_BC_RMS	31	Line voltage phase BC RMS, (10 = 1.0 Volts)	Source Utility Line Phase to Phase Voltage (B-C) Range: 0 to 1000 Vrms
V_LINE_CA_RMS	32	Line voltage phase CA RMS, (10 = 1.0 Volts)	Source Utility Line Phase to Phase Voltage (C-A) Range: 0 to 1000 Vrms
V_LINE_AB_THD	33	Line voltage phase AB THD, (10 = 1.0%)	
V_LINE_BC_THD	34	Line voltage phase BC THD, (10 = 1.0%)	
V_LINE_CA_THD	35	Line voltage phase CA THD, (10 = 1.0%)	
I_LINE_A_RMS	36	Line current phase A RMS, (10 = 1.0 Amps)	Filter Input Current Phase A Range: 0 to 1000 Arms
I_LINE_B_RMS	37	Line current phase B RMS, (10 = 1.0 Amps)	Filter Input Current Phase B Range: 0 to 1000 Arms
I_LINE_C_RMS	38	Line current phase C RMS, (10 = 1.0 Amps)	Filter Input Current Phase C Range: 0 to 1000 Arms
I_LINE_A_THD	39	Line current phase A THD, (10 = 1.0%)	
I_LINE_B_THD	40	Line current phase B THD, (10 = 1.0%)	
I_LINE_C_THD	41	Line current phase C THD, (10 = 1.0%)	
I_LINE_A_TDD	42	Filter input total Demand Distortion Phase A iTDD, (10 = 1.0%)	
I_LINE_B_TDD	43	Filter input total Demand Distortion Phase B iTDD, (10 = 1.0%)	
I_LINE_C_TDD	44	Filter input total Demand Distortion Phase C iTDD, (10 = 1.0%)	
V_LOAD_AB_RMS	50	Load voltage phase AB RMS, (10 = 1.0 Volts)	Filter Output Phase to Phase Voltage (A-B) Range: 0 to 1000 Vrms
V_LOAD_BC_RMS	51	Load voltage phase BC RMS, (10 = 1.0 Volts)	Filter Output Phase to Phase Voltage (B-C) Range: 0 to 1000 Vrms
V_LOAD_CA_RMS	52	Load voltage phase CA RMS, (10 = 1.0 Volts)	Filter Output Phase to Phase Voltage (C-A) Range: 0 to 1000 Vrms
V_LOAD_AB_THD	53	Load voltage phase AB THD, (10 = 1.0%)	
V_LOAD_BC_THD	54	Load voltage phase BC THD, (10 = 1.0%)	
V_LOAD_CA_THD	55	Load voltage phase CA THD, (10 = 1.0%)	
I_LOAD_A_RMS	56	Load current phase A RMS, (10 = 1.0 Amps)	Range: 0 to 1000 Arms
I_LOAD_B_RMS	57	Load current phase B RMS, (10 = 1.0 Amps)	
I_LOAD_C_RMS	58	Load current phase C RMS, (10 = 1.0 Amps)	

I_LOAD_A_THD	59	Load current phase A THD, (10 = 1.0%)	
I_LOAD_B_THD	60	Load current phase B THD, (10 = 1.0%)	
I_LOAD_C_THD	61	Load current phase C THD, (10 = 1.0%)	
V_TUNE_A_RMS	70	Tuned circuit voltage phase AB RMS, (10 = 1.0 Volts)	Range: 0 to 1000 Vrms
V_TUNE_B_RMS	71	Tuned circuit voltage phase BC RMS, (10 = 1.0 Volts)	
V_TUNE_C_RMS	72	Tuned circuit voltage phase CA RMS, (10 = 1.0 Volts)	
V_TUNE_A_THD	73	Tuned circuit voltage phase AB THD, (10 = 1.0%)	
V_TUNE_B_THD	74	Tuned circuit voltage phase BC THD, (10 = 1.0%)	
V_TUNE_C_THD	75	Tuned circuit voltage phase CA THD, (10 = 1.0%)	
I_TUNE_A_RMS	76	Tuned circuit current phase A RMS, (10 = 1.0 Amps)	Range: 0 to 1000 Arms
I_TUNE_B_RMS	77	Tuned circuit current phase B RMS, (10 = 1.0 Amps)	Range: 0 to 1000 Arms
I_TUNE_C_RMS	78	Tuned circuit current phase C RMS, (10 = 1.0 Amps)	Range: 0 to 1000 Arms
I_TUNE_A_THD	79	Tuned circuit current phase A THD, (10 = 1.0%)	
I_TUNE_B_THD	80	Tuned circuit current phase B THD, (10 = 1.0%)	
I_TUNE_C_THD	81	Tuned circuit current phase 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: 0 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 -95 = 0.95 Lagging PF 95 = 0.95 Leading PF Range: -99 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, (car)	Total Filter output reactive power: Negative number indicates inductive power. Positive

			number indicates capacitive power Range: 0 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: -99 to 1000
P_LOAD_REAL_MEAS	124	Measured Load real power, (kW)	
I_LINE_A_HARM_1	140	Line Current Fundamental Phase A, (10 = 1.0%)	**Not EtherNet Enabled** Range: 0 to 100 %
I_LINE_A_HARM_3	141	Line Current 3rd Harmonic Phase A, (10 = 1.0%)	
I_LINE_A_HARM_5	142	Line Current 5th Harmonic Phase A, (10 = 1.0%)	
I_LINE_A_HARM_7	143	Line Current 7th Harmonic Phase A, (10 = 1.0%)	
I_LINE_A_HARM_11	144	Line Current 11th Harmonic Phase A, (10 = 1.0%)	
I_LINE_A_HARM_13	145	Line Current 13th Harmonic Phase A, (10 = 1.0%)	
I_LINE_A_HARM_17	146	Line Current 17th Harmonic Phase A, (10 = 1.0%)	
I_LINE_A_HARM_19	147	Line Current 19th Harmonic Phase A, (10 = 1.0%)	
I_LINE_A_HARM_23	148	Line Current 23rd Harmonic Phase A, (10 = 1.0%)	
I_LINE_A_HARM_25	149	Line Current 25th Harmonic Phase A, (10 = 1.0%)	
I_LINE_B_HARM_1	160	Line Current Fundamental Phase B, (10 = 1.0%)	
I_LINE_B_HARM_3	161	Line Current 3rd Harmonic Phase B, (10 = 1.0%)	
I_LINE_B_HARM_5	162	Line Current 5th Harmonic Phase B, (10 = 1.0%)	

I_LINE_B_HARM_7	163	Line Current 7th Harmonic Phase B, (10 = 1.0%)	
I_LINE_B_HARM_11	164	Line Current 11th Harmonic Phase B, (10 = 1.0%)	
I_LINE_B_HARM_13	165	Line Current 13th Harmonic Phase B, (10 = 1.0%)	
I_LINE_B_HARM_17	166	Line Current 17th Harmonic Phase B, (10 = 1.0%)	
I_LINE_B_HARM_19	167	Line Current 19th Harmonic Phase B, (10 = 1.0%)	
I_LINE_B_HARM_23	168	Line Current 23rd Harmonic Phase B, (10 = 1.0%)	
I_LINE_B_HARM_25	169	Line Current 25th Harmonic Phase B, (10 = 1.0%)	
I_LINE_C_HARM_1	180	Line Current Fundamental Phase C, (10 = 1.0%)	
I_LINE_C_HARM_3	181	Line Current 3rd Harmonic Phase C, (10 = 1.0%)	
I_LINE_C_HARM_5	182	Line Current 5th Harmonic Phase C, (10 = 1.0%)	
I_LINE_C_HARM_7	183	Line Current 7th Harmonic Phase C, (10 = 1.0%)	
I_LINE_C_HARM_11	184	Line Current 11th Harmonic Phase C, (10 = 1.0%)	
I_LINE_C_HARM_13	185	Line Current 13th Harmonic Phase C, (10 = 1.0%)	
I_LINE_C_HARM_17	186	Line Current 17th Harmonic Phase C, (10 = 1.0%)	
I_LINE_C_HARM_19	187	Line Current 19th Harmonic Phase C, (10 = 1.0%)	
I_LINE_C_HARM_23	188	Line Current 23rd Harmonic Phase C, (10 = 1.0%)	
I_LINE_C_HARM_25	189	Line Current 25th Harmonic Phase C, (10 = 1.0%)	
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, (10 = 1.0 deg C)	Board will give a status condition of overtempt if it exceeds 75C or undertemp if the temperature descends past -40C Range: -40C to 75C
STATUS_FILTER_A	210	Filter status detection active A 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	211	Filter status detection active B 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_LINE	212	Line status detection active bit mask	
STATUS_FILTER_LOAD	213	Filter load status detection bit mask	
STATUS_FILTER_A_ENABLE_RO	220	Filter status A detection enable bit mask	
STATUS_FILTER_B_ENABLE_RO	221	Filter status B detection enable bit mask	
STATUS_LINE_ENABLE_RO	222	Line status detection enable bit mask	
STATUS_FILTER_LOAD_ ENABLE_RO	223	Filter load status detection enable bit mask	
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	

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	
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	
STATUS_FILTER_LOAD_ CNT_ACTION_RO	243	Filter load status tune contactor action enable bit mask	
SYS_CONTROL_MODE_RO	250	Control Mode	**Not EtherNet Enabled** Contactor control keep contactor always off/on, auto turn on/off based on desired load percentage or kVAR, external relay input. 0 = Always Open 1 = Always Closed 2= Auto load 3 = Auto kVAR 4 = External Control Input 5 = No contactor
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 1000 = 1000:5 Range 5 to 10000

PARAM_ACCESS_LEVEL_ RO	254	Parameter access level	**Not EtherNet Enabled** 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 - Read only value 0-11, 13-17 = restore, parameter load, save, reboot in progress. 12 = parameter load complete
SYS_STATE	256	System state	Indicates the present state of the system state machine 0,1 = Initialization 2 = Power on Delay 3 = Unit Self State Inhibit 4 = Reset 5 = Force Open Contactor 6 = Force Close Contactor 7 = Auto Load Open 8 = Auto Load Close 9 = 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 = Calibrate Check
CNT_STATUS	257	Contactor command status	
RATED_VOLTAGE_RO	260	Unit Rated Voltage, (10 = 1.0 Volts)	**Not EtherNet Enabled** Filter Rated Voltage Range: 120 to 690 Vrns
RATED_CURRENT_RO	261	Unit Rated Current, (10 = 1.0 Amps)	**Not EtherNet Enabled** Filter rated Current Range: 3 to 1500 Arms
RATED_FREQUENCY_RO	262	Unit Rated Frequency, (Hz)	**Not EtherNet Enabled** Filter Rated Frequency
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, (Percent rated current)	**Not EtherNet Enabled** Contactor will open when it reaches the hysteresis percentage 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 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 set value of attempts 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 timespan of contactor to reclose 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 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	Modbus baud rate, (bits per second)	**Not EtherNet Enabled** Modbus Baud Rate Default: 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 0 =Enabled 1 = Disabled
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 (0=disabled, 1=reset command, 2= temperature switch input)	**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 UUU in the UUULLLL-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 UUULLLL-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 UUULLLL-NN serial number format.
PCB_SERIAL_NUM_1_RO	353	MS portion of PCB serial #	**Not EtherNet Enabled**
PCB_SERIAL_NUM_0_RO	354	LS portion of PCB serial #	**Not EtherNet Enabled**
PCB_TEST_NUM_RO	355	Test number of the PCB serial number	**Not EtherNet Enabled**
SYS_DS_MODE	360	Data simulation mode active	Indicates if the Processor is in data simulation mode 0 = Not in Data Sim Mode 1 = Data Sim Mode
CONFIG_MODE_ACTIVE	365	Active feedback sensing configuration mode	
BGM_PASSKEY_A	375	Wireless password high bytes, (Bits)	**Not EtherNet Enabled** Read Only value of BGM password high bytes. Range: 0 to 15
BGM_PASSKEY_B	376	Wireless password set low bytes, (Bits)	**Not EtherNet Enabled** 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	Current status of the BGM (Bluetooth LE module) 0 = Idle 1 = Advertising 2 = Connected
FIELDBUS_STATUS_A	381	Field Bus communication status A Register	
FIELDBUS_STATUS_B	382	Field Bus communication status B Register	
ETH_IP_ADDR_A	383	EtherNet/IP IP Address Upper 16 Bits	
ETH_IP_ADDR_B	384	EtherNet/IP IP Address Lower 16 Bits	
ETH_SUB_NET_A	385	EtherNet/IP Subnet Upper 16 Bits	
ETH_SUB_NET_B	386	EtherNet/IP Subnet Lower 16 Bits	
ETH_DEF_GATEWAY_A	387	EtherNet/IP Gateway Upper 16 Bits	
ETH_DEF_GATEWAY_B	388	EtherNet/IP Gateway Lower 16 Bits	
FB_CONFIG	389	Fieldbus Configuration Status	
FB_LED	390	Fieldbus Debug LED's	
ETH_MAC_ADDR_A	391	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 Read-only 0 = Not Calibrated 1 = Unit 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) 0 = Unit is not in Calibration Mode 1 = Unit is in Calibration Mode
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	
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 no load cap current, (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	
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,

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. 9 = Save Current Values to Flash 21 = Set User Access 25 = Set Access to Tech Access (access key needs to be set to 125 for key A and 60014 for key B) 150 = Load Values from Flash 200 = Restore Defaults to Flash 300 = Restore Calibration Defaults
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, (Amps)	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, (10=1.0A or per unit with base of 16384 counts)	Default:0 Range:0 to 1	Changes the scaling of the waveforms displayed on PQvision 0 = A / 10 1 = Per Unit
SYS_CONTROL_MODE	510	Contactor control mode	Default:2 Range:0 to 6	Contactor control keep contactor always off/on, auto turn on/off based on desired load percentage or kVAR, external relay input. 0 = Always Open 1 = Always Closed 2= Auto load 3 = Auto kVAR 4 = External Control Input 5 = No contactor
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, (10 = 1.0 Amps)	Default:2500 Range:30 to 15000	Filter rated Current Range: 3 to 1500 Arms
RATED_VOLTAGE	521	Unit rated voltage, (10 = 1.0 Volts)	Default:4800 Range:1200 to 6900	Filter Rated Voltage Range: 120 to 690 Vrns
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	Data Sim Parameter
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	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 Filter Status Reference Table 0 = Disabled
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	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 Line Status Detection bits 0 = Disabled
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

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 enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
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	
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 enabled desired status detections, enter bit mask from table by converting to decimal Range: 0 to 65535
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: -7 to 7	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 time span, (sec)	Default:600 Range:300 to 65535	Maximum number of contactors auto re-close attempts time span
MB_SLAVE_ADDRESS	600	ModbusRTU device server address	Default:10 Range:1 to 247	Modbus Slave Address Default: 10 Range: 1 to 247

MB_BAUD_RATE	601	ModbusRTU device baud rate, (bits per second)	Default:11520 Range:0 to 11520	Modbus Baud Rate Default: 11520 = 115200 baud rate 960 = 9600 baud rate 3840 = 38400 baud rate
MB_PARITY	602	ModbusRTU device parity	Default:2 Range:0 to 2	0 = None 1 = Odd 2 = Even
MB_SAVE_SET_FLAG	603	MNodbusRTU save new settings	Default:0 Range:0 to 2	
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, (percent rated voltage)	Default:130 Range:100 to 150	
V_LINE_OV_CLEAR	621	Overvoltage clear threshold, (percent rated voltage)	Default:125 Range:90 to 140	
V_LINE_OV_DELAY	622	Overvoltage delay time, (sec)	Default:2 Range:1 to 3600	
V_LINE_UV_ONSET	623	Undervoltage phase loss onset threshold, (percent rated voltage)	Default:75 Range:50 to 90	
V_LINE_UV_CLEAR	624	Undervoltage phase loss clear threshold, (percent rated voltage)	Default:80 Range:60 to 100	
V_LINE_UV_DELAY	625	Undervoltage phase loss delay time, (sec)	Default:1 Range:1 to 3600	
I_LINE_OC_ONSET	626	Overcurrent onset threshold, (percent rated current)	Default:150 Range:100 to 200	
I_LINE_OC_CLEAR	627	Overcurrent clear threshold,	Default:140 Range:90 to 190	

		(percent rated current)		
I_LINE_OC_DELAY	628	Overcurrent delay time, (sec)	Default:5 Range:1 to 3600	
I_LOAD_BALANCE_ONSET	640	Load current balance onset threshold, (Percent rated current)	Default:75 Range:10 to 90	
I_LOAD_BALANCE_CLEAR	641	Load current balance clear threshold, (Percent rated current)	Default:80 Range:10 to 90	
I_LOAD_BALANCE_DELAY	642	Load current balance delay time, (sec)	Default:4 Range:1 to 3600	
I_LOAD_BALANCE_MIN_CURRENT	643	Load current balance minimum detect current, (percent rated current)	Default:50 Range:10 to 100	
I_TUNE_OC_ONSET	660	Tune overcurrent onset threshold, (percent rated current)	Default:150 Range:100 to 200	
I_TUNE_OC_CLEAR	661	Tune overcurrent clear threshold, (percent rated current)	Default:140 Range:90 to 190	
I_TUNE_OC_DELAY	662	Tune overcurrent delay time, (sec)	Default:4 Range:1 to 3600	
I_TUNE_UC_ONSET	663	Tune circuit fundamental undercurrent onset threshold, (Percent rated current)	Default:65 Range:10 to 100	
I_TUNE_UC_CLEAR	664	Tune circuit fundamental undercurrent clear threshold, (Percent rated current)	Default:70 Range:15 to 100	
I_TUNE_UC_DELAY	665	Tune circuit fundamental undercurrent delay time, (sec)	Default:3 Range:1 to 3600	
I_TUNE_BALANCE_ONSET	666	Tune circuit current balance onset threshold, (Percent rated current)	Default:75 Range:10 to 90	
I_TUNE_BALANCE_CLEAR	667	Tune circuit current balance clear threshold, (Percent rated current)	Default:80 Range:10 to 90	
I_TUNE_BALANCE_DELAY	668	Tune circuit current balance delay time, (sec)	Default:2 Range:1 to 3600	

T_AMBIENT_OT_ONSET	680	Controls overtemperature onset threshold, (10 = 1.0 deg C)	Default:700 Range:100 to 850	
T_AMBIENT_OT_CLEAR	681	Controls overtemperature clear threshold, (10 = 1.0 deg C)	Default:600 Range:50 to 800	
T_AMBIENT_OT_DELAY	682	Controls overtemperature delay time, (sec)	Default:5 Range:1 to 3600	
FAULT_HIGH_THD_ONSET	690	Voltage THD high onset threshold, (percent rated voltage)	Default:80 Range:20 to 200	
FAULT_HIGH_THD_CLEAR	691	Voltage THD high clear threshold, (percent rated voltage)	Default:110 Range:20 to 200	
FAULT_HIGH_THD_DELAY	692	Voltage THD high delay time, (sec)	Default:3 Range:1 to 3600	
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, (10 = 1.0A)	Default:0 Range:0 to 65535	Input current measured on A phase of the filter
SYS_I_LINE_CAL_B	711	Reference calibration current line phase B, (10 = 1.0A)	Default:0 Range:0 to 65535	Input current measured on B phase of the filter
SYS_I_LINE_CAL_C	712	Reference calibration current line phase C, (10 = 1.0A)	Default:0 Range:0 to 65535	Input current measured on C phase of the filter
SYS_I_TUNE_CAL_A	713	Reference calibration current tune phase A, (10 = 1.0A)	Default:0 Range:0 to 65535	Tune circuit current measured on A phase of the filter
SYS_I_TUNE_CAL_B	714	Reference calibration current tune phase B, (10 = 1.0A)	Default:0 Range:0 to 65535	Tune circuit current measured on B phase of the filter
SYS_I_TUNE_CAL_C	715	Reference calibration current tune phase C, (10 = 1.0A)	Default:0 Range:0 to 65535	Tune circuit current measured on C phase of the filter
SYS_MAG_CAL_TOL	716	Current calculation magnitude calibration tolerance, (10 = 1.0A)	Default:5 Range:0 to 15000	System mag calibration state 0 = Calibration Command not active 1 = Enter calibration state
I_LINE_EST_A_SCALAR	720	Magnitude scalar for current calculation line phase A	Default:6000 Range: -32768 to 32767	Value set by Factory

I_LINE_EST_B_SCALAR	721	Magnitude scalar for current calculation line phase B	Default:6000 Range: -32768 to 32767	Value set by Factory
I_LINE_EST_C_SCALAR	722	Magnitude scalar for current calculation line phase C	Default:6000 Range: -32768 to 32767	Value set by Factory
I_TUNE_EST_A_SCALAR	723	Magnitude scalar for current calculation tune phase A	Default:4000 Range: -32768 to 32767	Value set by Factory
I_TUNE_EST_B_SCALAR	724	Magnitude scalar for current calculation tune phase B	Default:4000 Range: -32768 to 32767	Value set by Factory
I_TUNE_EST_C_SCALAR	725	Magnitude scalar for current calculation tune phase C	Default:4000 Range: -32768 to 32767	Value set by Factory
V_LINE_SCALAR_A	730	Magnitude scalar for line voltage phase AB	Default:5982 Range: -32768 to 32767	Value set by Factory
V_LINE_SCALAR_B	731	Magnitude scalar for line voltage phase BC	Default:5982 Range: -32768 to 32767	Value set by Factory
V_LINE_SCALAR_C	732	Magnitude scalar for line voltage phase CA	Default:5982 Range: -32768 to 32767	Value set by Factory
V_LOAD_SCALAR_A	733	Magnitude scalar for load voltage phase AB	Default:5982 Range: -32768 to 32767	Value set by Factory
V_LOAD_SCALAR_C	734	Magnitude scalar for load voltage phase CA	Default:5982 Range: -32768 to 32767	Value set by Factory
V_TUNE_SCALAR_A	735	Magnitude scalar for tune voltage phase AB	Default:5982 Range:-32768 to 32767	Value set by Factory
V_TUNE_SCALAR_C	736	Magnitude scalar for tune voltage phase CA	Default:5982 Range:-32768 to 32767	Value set by Factory
I_LINE_SCALAR_A	737	Magnitude scalar for line current CT phase A	Default:1091 Range:-32768 to 32767	Value set by Factory
I_LINE_SCALAR_C	738	Magnitude scalar for line current CT phase C	Default:1091 Range:-32768 to 32767	Value set by Factory
I_TUNE_SCALAR_A	739	Magnitude scalar for tune current CT phase A	Default:1091 Range:-32768 to 32767	Value set by Factory
I_TUNE_SCALAR_C	740	Magnitude scalar for tune current CT phase A	Default:1091 Range:-32768 to 32767	Value set by Factory
T_AMBIENT_SCALAR	741	Magnitude scalar for controls temperature	Default:12000 Range:-32768 to 32767	Value set by Factory
V_LINE_RMS_SCALAR	750	RMS calculation scalar for line voltage	Default:437 Range:-32768 to 32767	Value set by Factory
V_LOAD_RMS_SCALAR	751	RMS calculation scalar for load voltage	Default:437 Range:-32768 to 32767	Value set by Factory
I_LINE_RMS_SCALAR	752	RMS calculation scalar for line current	Default:128 Range:-32768 to 32767	Value set by Factory

I_LOAD_RMS_SCALAR	753	RMS calculation scalar for load current	Default:128 Range:-32768 to 32767	Value set by Factory
SYS_CNT_MIN_OFF_TIME	800	Contactor minimum open time,(sec)	Default:10 Range:10 to 300	
I_TUNE_TAP_GAIN	801	Line reactor tap turn coupling gain	Default:1820 Range:-32768 to 32767	Value set by Factory
V_THD_SCALAR	802	Voltage THD gain adjustment factor	Default:16384 Range:-32768 to 32767	Value set by Factory
I_THD_SCALAR	803	Current THD gain adjustment factor	Default:16384 Range:-32768 to 32767	Value set by Factory
V_THD_OFFSET	804	Voltage THD offset adjustment factor	Default:0 Range:-32768 to 32767	Value set by Factory
I_THD_OFFSET	805	Current THD offset adjustment factor	Default:0 Range:-32768 to 32767	Value set by Factory
SYS_NULL_EN	820	Factory PCB calibration enable	Default:0 Range:0 to 1	
V_LINE_A_OFFSET	830	Line voltage offset phase A	Default:2048 Range:0 to 4096	Value set by Factory
V_LINE_B_OFFSET	831	Line voltage offset phase B	Default:2048 Range:0 to 4096	Value set by Factory
V_LINE_C_OFFSET	832	Line voltage offset phase C	Default:2048 Range:0 to 4096	Value set by Factory
V_LOAD_A_OFFSET	833	Load voltage offset phase A	Default:2048 Range:0 to 4096	Value set by Factory
V_LOAD_C_OFFSET	834	Load voltage offset phase C	Default:2048 Range:0 to 4096	Value set by Factory
V_TUNE_A_OFFSET	835	Tune voltage offset phase A	Default:2048 Range:0 to 4096	Value set by Factory
V_TUNE_C_OFFSET	836	Tune voltage offset phase C	Default:2048 Range:0 to 4096	Value set by Factory
V_DIFF_LINE_A_OFFSET	837	Reactor Diff Voltage Offset Phase A	Default:2048 Range:0 to 4096	Value set by Factory
V_DIFF_LINE_B_OFFSET	838	Reactor Diff Voltage Offset Phase B	Default:2048 Range:0 to 4096	Value set by Factory
V_DIFF_LINE_C_OFFSET	839	Reactor Diff Voltage Offset Phase C	Default:2048 Range:0 to 4096	Value set by Factory
V_DIFF_TUNE_A_OFFSET	840	Reactor Diff Voltage Offset Phase A	Default:2048 Range:0 to 4096	Value set by Factory
V_DIFF_TUNE_B_OFFSET	841	Reactor Diff Voltage Offset Phase B	Default:2048 Range:0 to 4096	Value set by Factory
V_DIFF_TUNE_C_OFFSET	842	Reactor Diff Voltage Offset Phase C	Default:2048 Range:0 to 4096	Value set by Factory
I_LINE_A_OFFSET	843	Line Current Offset Phase A for CT Input	Default:2048 Range:0 to 8192	Value set by Factory

I_LINE_C_OFFSET	844	Line Current Offset Phase A for CT Input	Default:2048 Range:0 to 8192	Value set by Factory
I_LOAD_A_OFFSET	845	Load Current Offset Phase A for CT input	Default:2048 Range:0 to 8192	Value set by Factory
I_LOAD_C_OFFSET	846	Load Current Offset Phase A for CT input	Default:2048 Range:0 to 8192	Value set by Factory
T_AMBIENT_OFFSET	847	Offset for controls temperature	Default:683 Range:-8192 to 8192	Value set by Factory Value set by Factory
V_DIFF_LINE_A_SCALAR	850	Line reactor voltage scalar phase A	Default:16384 Range:-32768 to 32767	Value set by Factory
V_DIFF_LINE_B_SCALAR	851	Line reactor voltage scalar phase B	Default:16384 Range:-32768 to 32767	Value set by Factory
V_DIFF_LINE_C_SCALAR	852	Line reactor voltage scalar phase C	Default:16384 Range:-32768 to 32767	Value set by Factory
V_DIFF_TUNE_A_SCALAR	853	Tune reactor voltage scalar phase A	Default:16384 Range:-32768 to 32767	Value set by Factory
V_DIFF_TUNE_B_SCALAR	854	Tune reactor voltage scalar phase B	Default:16384 Range:-32768 to 32767	Value set by Factory
V_DIFF_TUNE_C_SCALAR	855	Tune reactor voltage scalar phase C	Default:16384 Range:-32768 to 32767	Value set by Factory
I_LINE_EST_A_INT_DECAY	860	Line current estimation decay phase A	Default:16375 Range:0 to 65535	Value set by Factory
I_LINE_EST_B_INT_DECAY	861	Line current estimation decay phase B	Default:16375 Range:0 to 65535	Value set by Factory
I_LINE_EST_C_INT_DECAY	862	Line current estimation decay phase C	Default:16375 Range:0 to 65535	Value set by Factory Value set by Factory
I_TUNE_EST_A_INT_DECAY	863	Tune current estimation decay phase A	Default:16375 Range:0 to 65535	Value set by Factory
I_TUNE_EST_B_INT_DECAY	864	Tune current estimation decay phase B	Default:16375 Range:0 to 65535	Value set by Factory
I_TUNE_EST_C_INT_DECAY	865	Tune current estimation decay phase C	Default:16375 Range:0 to 65535	Value set by Factory
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** **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** **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** **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** **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**
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** **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** **200 = KIT**
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 - two-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_NUM_0	907	Lower 16 bits of the PCB serial number	Default:0 Range:0 to 65535	
PCB_TEST_NUM	908	Test number of the PCB serial number	Default:0 Range:0 to 65535	
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	
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	
RATED_STEP_1_CAP	980	Unit rated capacitance for tune step 1, (10 = 0.1 uFarad)	Default:575 Range:0 to 20000	Filter rated (step 1) capacitance Used for tune circuit no load current.

RATED_STEP_2_CAP	981	Unit rated capacitance for tune step 2 , (10 = 0.1 uFarad)	Default:0 Range:0 to 20000	Filter rated (step 2) capacitance (Only used for filters with dual tuned circuits) Used for tune circuit no load current
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, (100 = 1.0)	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, (100 = 1.0)	Default:115 Range:100 to 140	100 = 1.0
CONFIG_MODE	986	Feedback sensing configuration mode selection	Default:1 Range:1 to 3	
POWER_CYC_COUNT	988	Running number of powers on-off cycles	Default:0 Range:0 to 0	
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

Register References

Table 30: 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 31: 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 32: 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

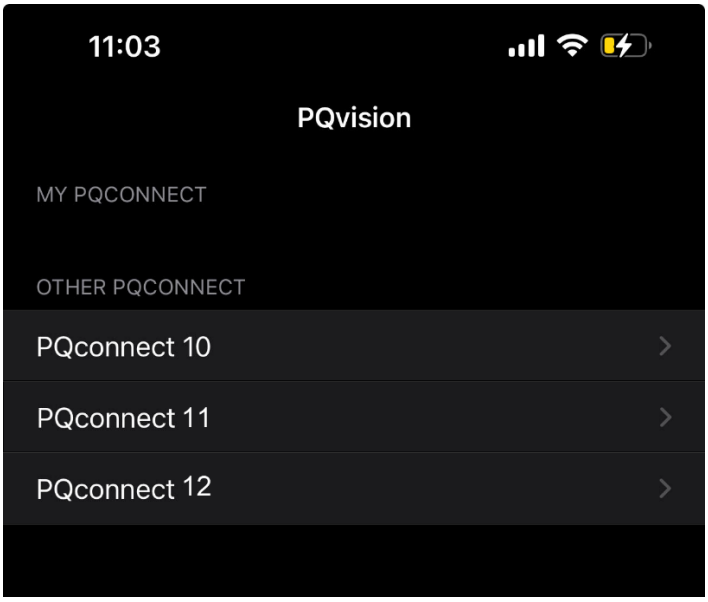
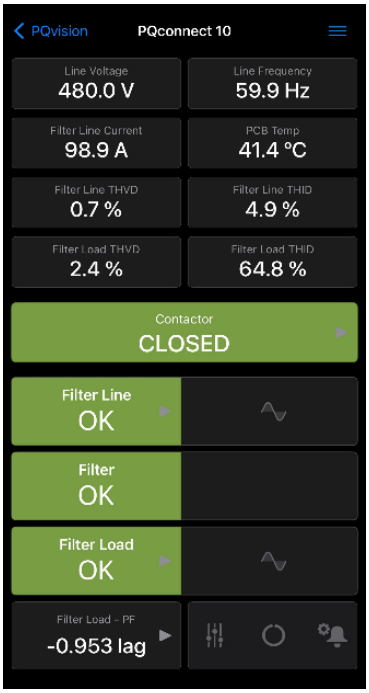
The waveform data displayed by the PQconnect is available in the Modbus read analog input register data space. Use function code 4 for reading inputs.

Table 33: 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

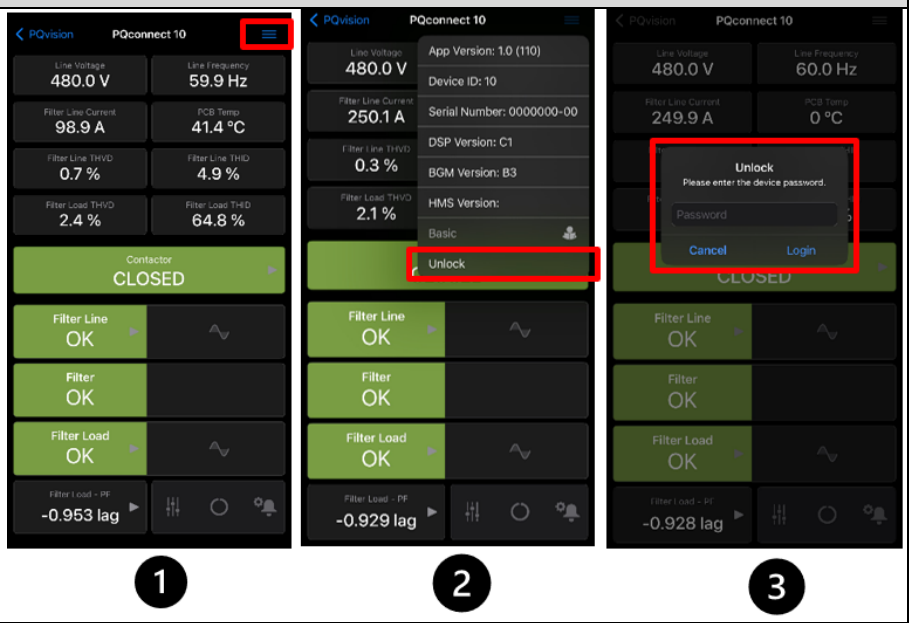
Bluetooth Wireless Technology

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 "**111111**"	
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 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 34: 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 16: 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.

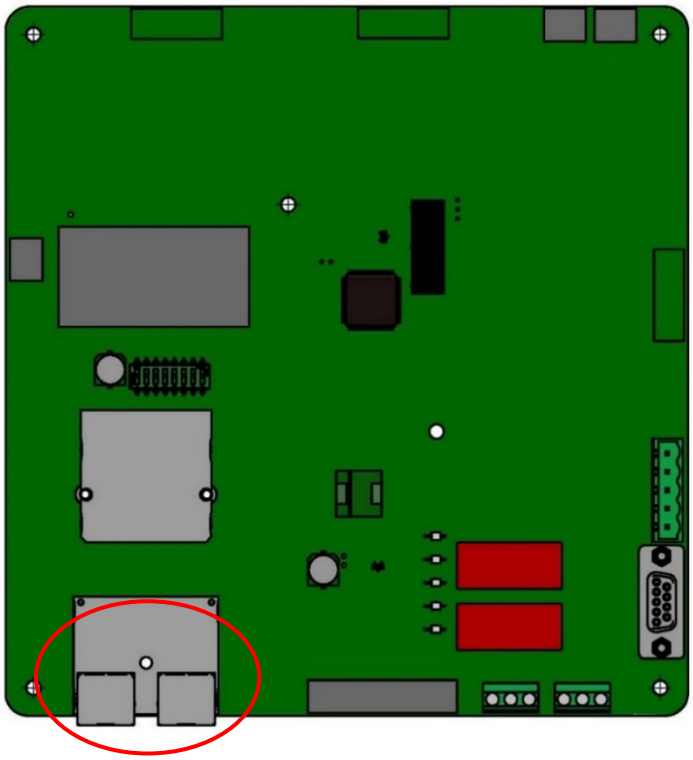
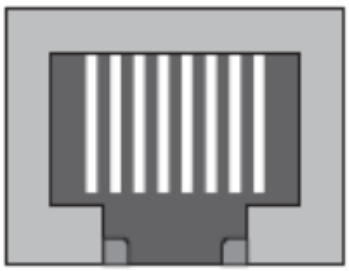


Figure 37: PQconnect Ethernet Connection Headers (Circled in Red)



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

Table 35: 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 36: 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.

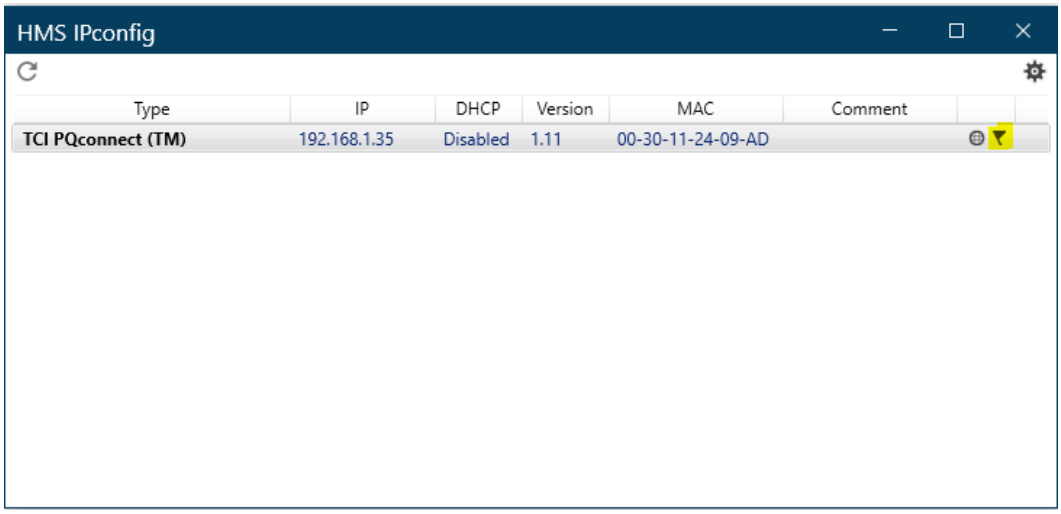


Figure 38: Flag Icon Highlight

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.

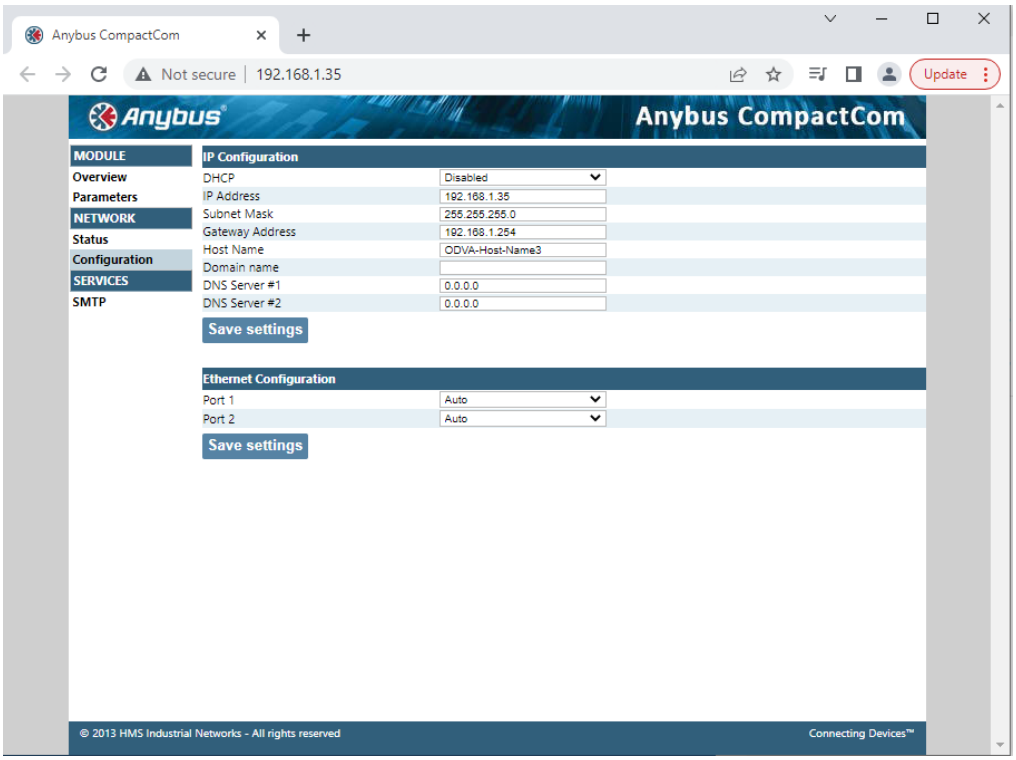


Figure 39: HMS IP Config EtherNet/IP Configuration Tool

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 40: 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 with 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.

Installing PQconnect EDS File in RSLogix 5000

1. Download the PQconnect EDS file with Add-on Profile 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.

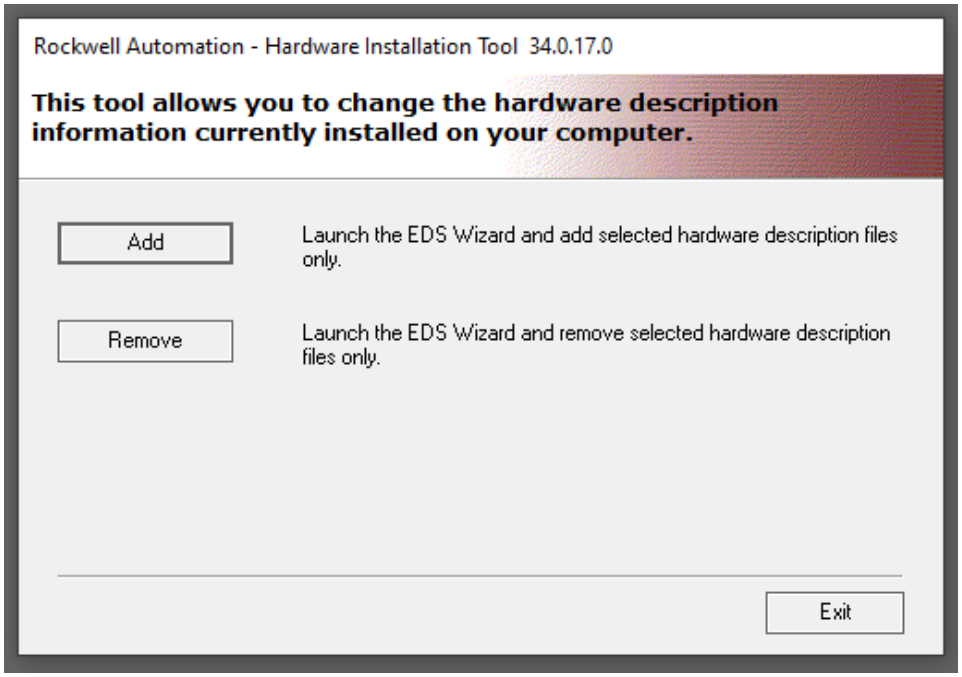


Figure 41: EDS Hardware Installation Tool

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.

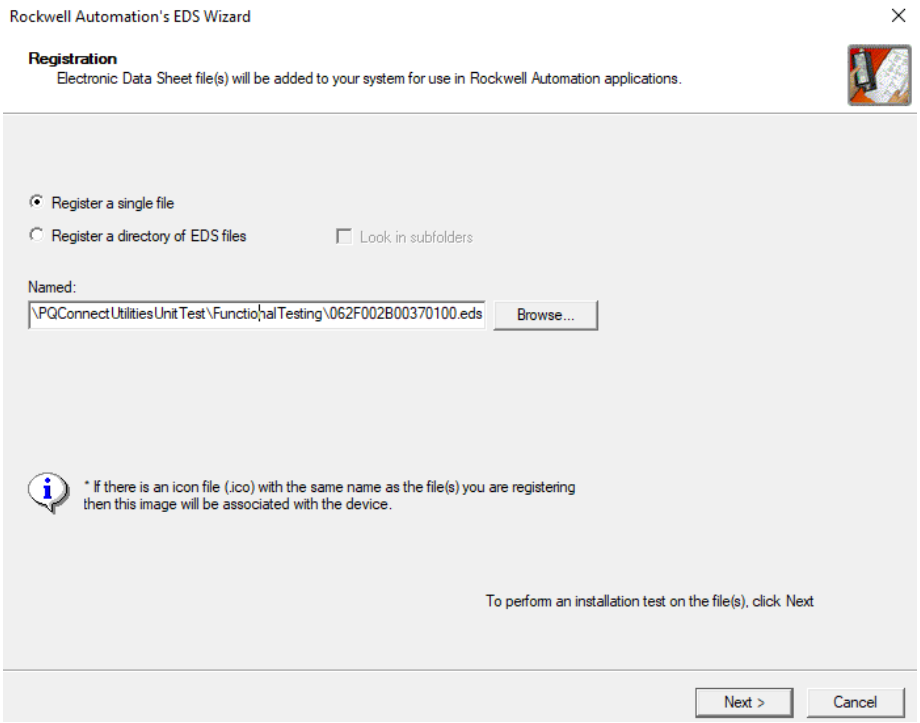


Figure 42: EDS File Registration

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.

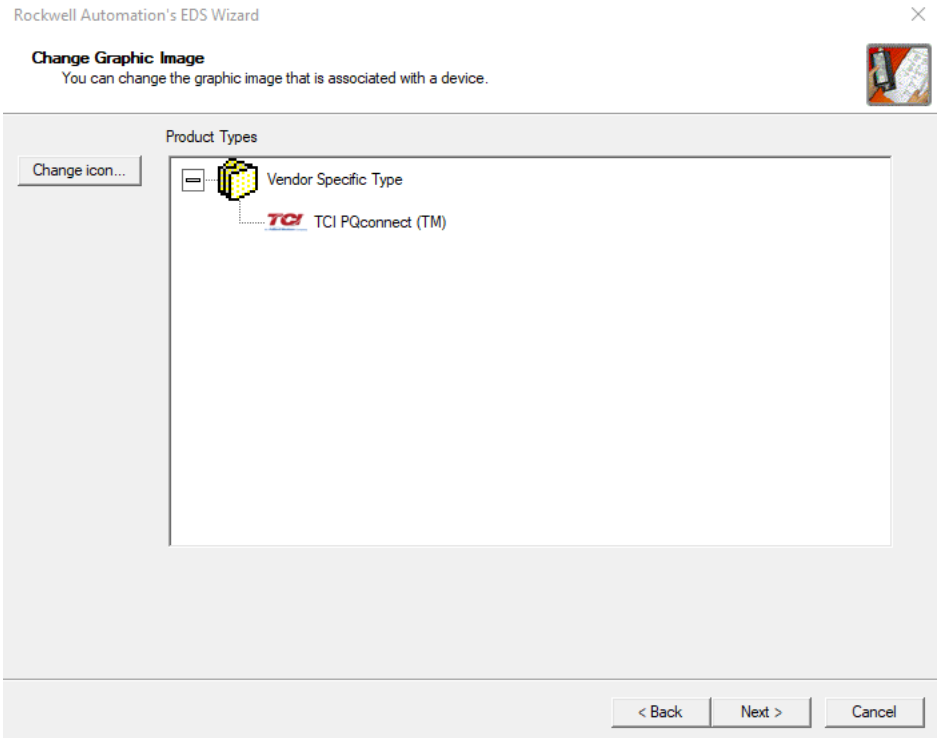


Figure 43: Change Graphic Image Screen

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.

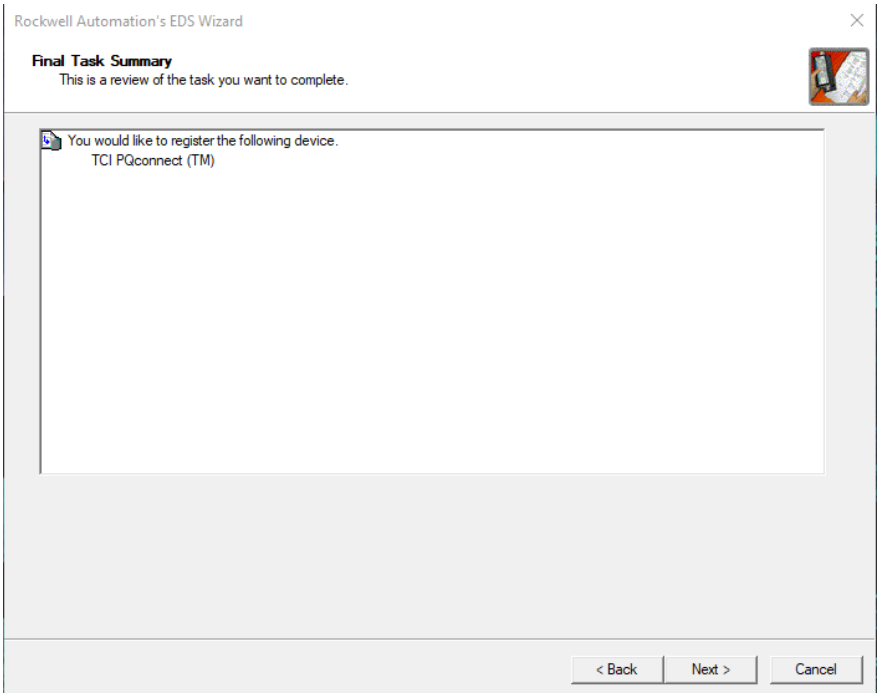


Figure 44: Final Task Summary Screen

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

Viewing the PQconnect device in RSLogix 5000

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.

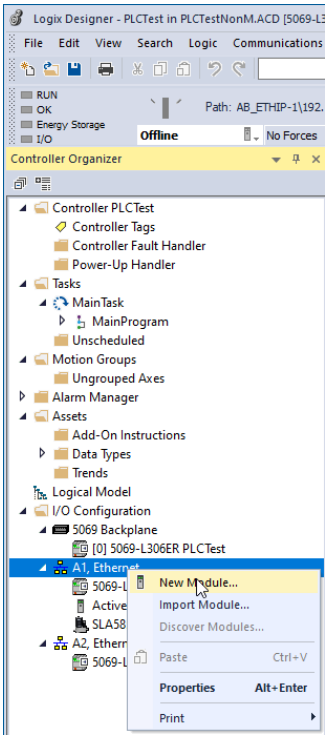


Figure 45: New Module

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.

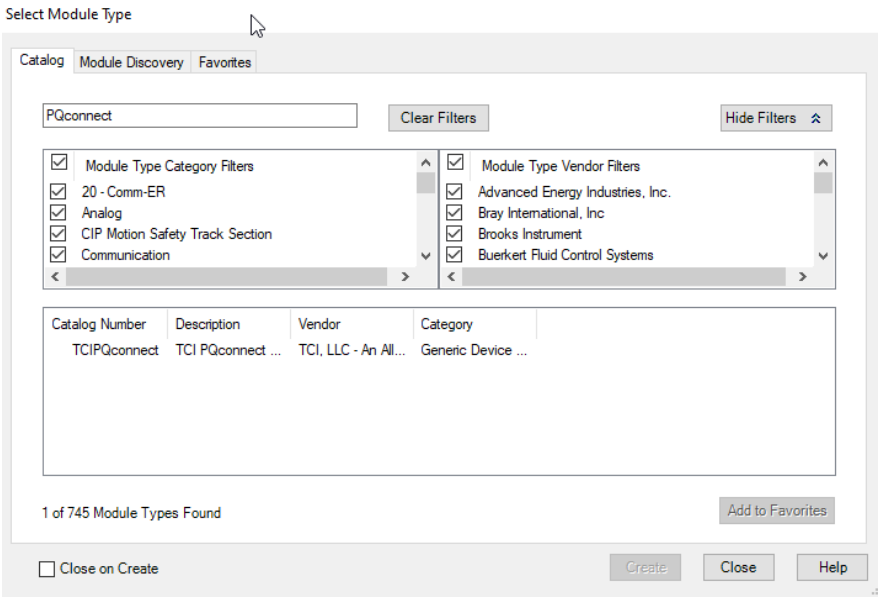


Figure 46: PQconnect Board in Module

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.

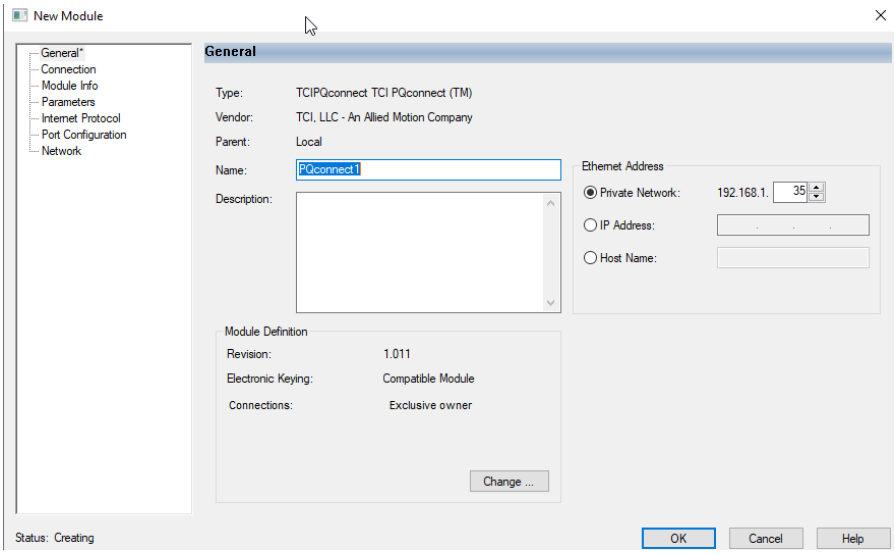


Figure 47: Module Created Screen

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.

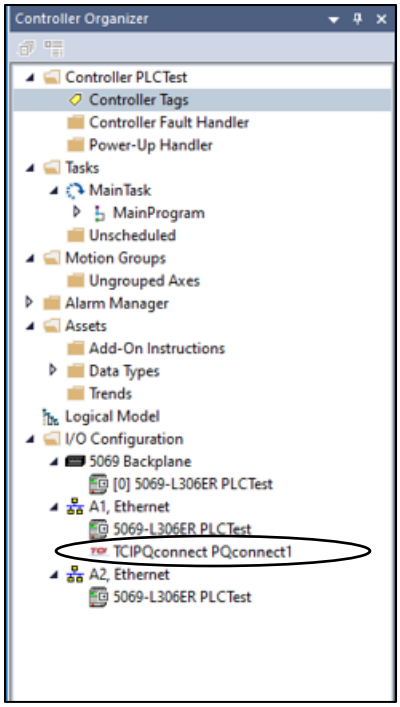


Figure 48: Controller Organizer Location with PQconnect

Viewing Rockwell's Licensed EDS AOP 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.

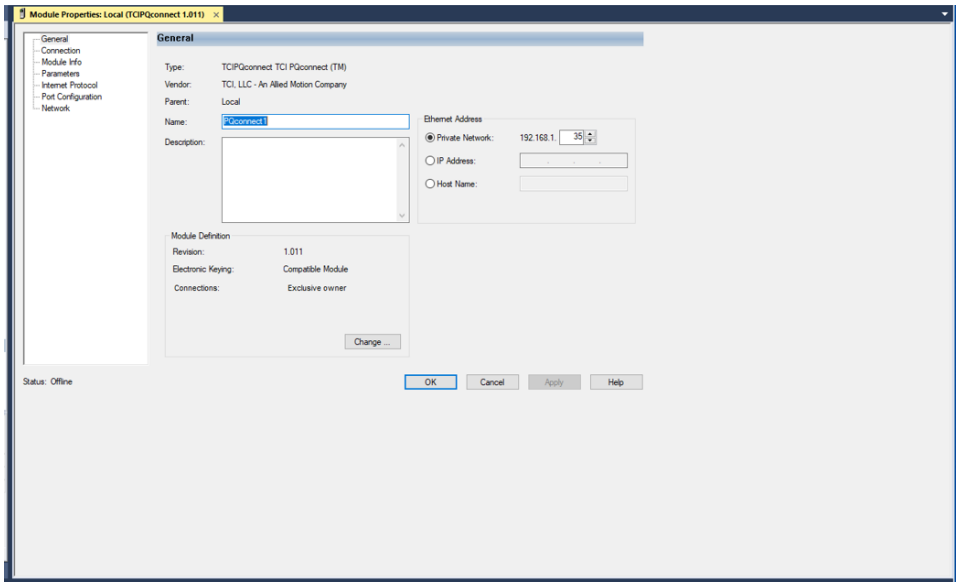


Figure 49: Module Properties Window

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.

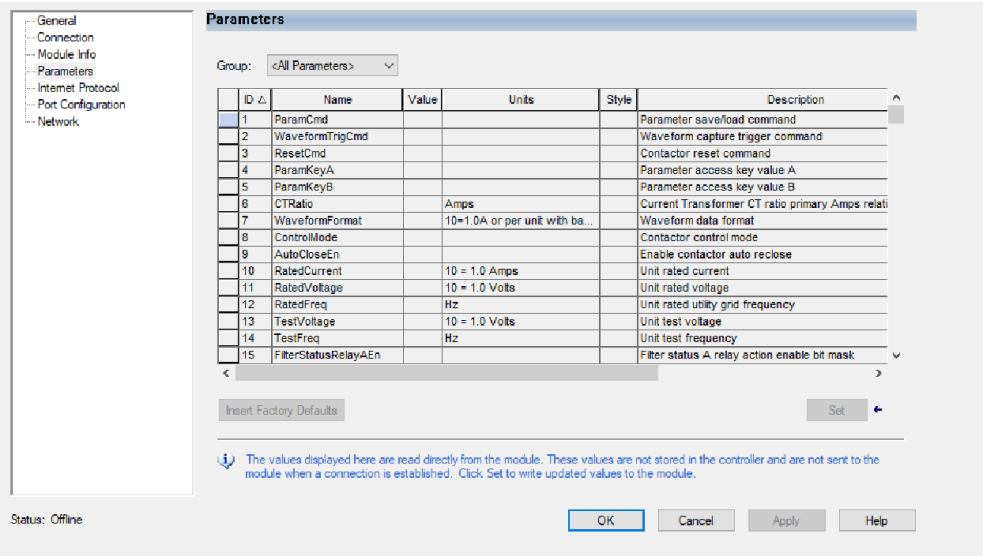


Figure 50: Parametetr Sub Section Screen

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

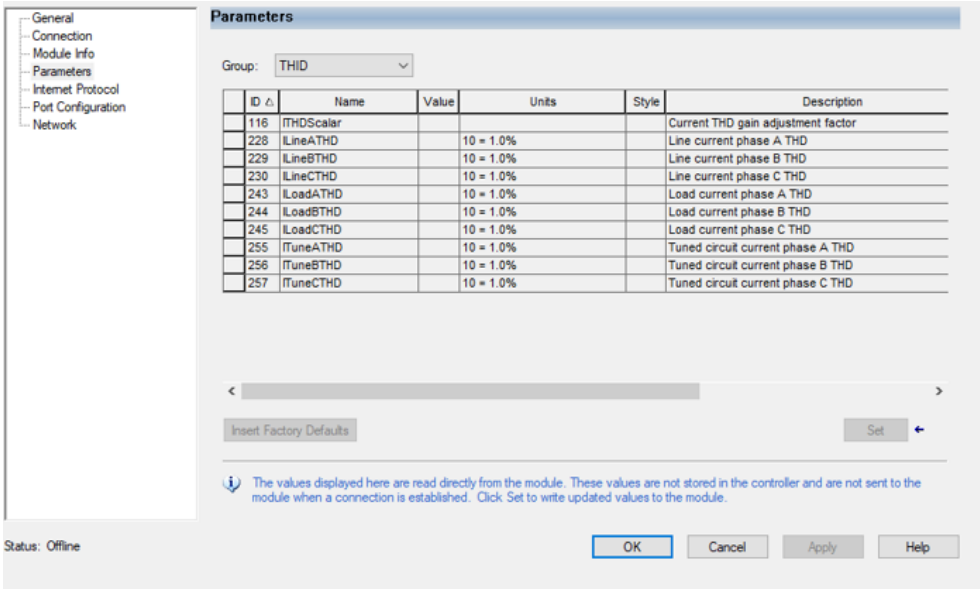


Figure 51: THD Group Selection Screen

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.

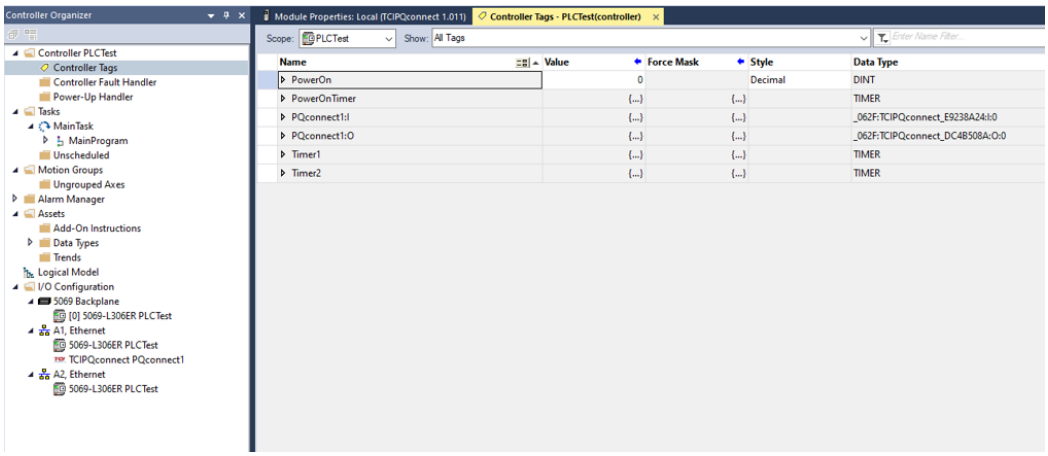


Figure 52: PQconnect Consuming and Producing Data

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.

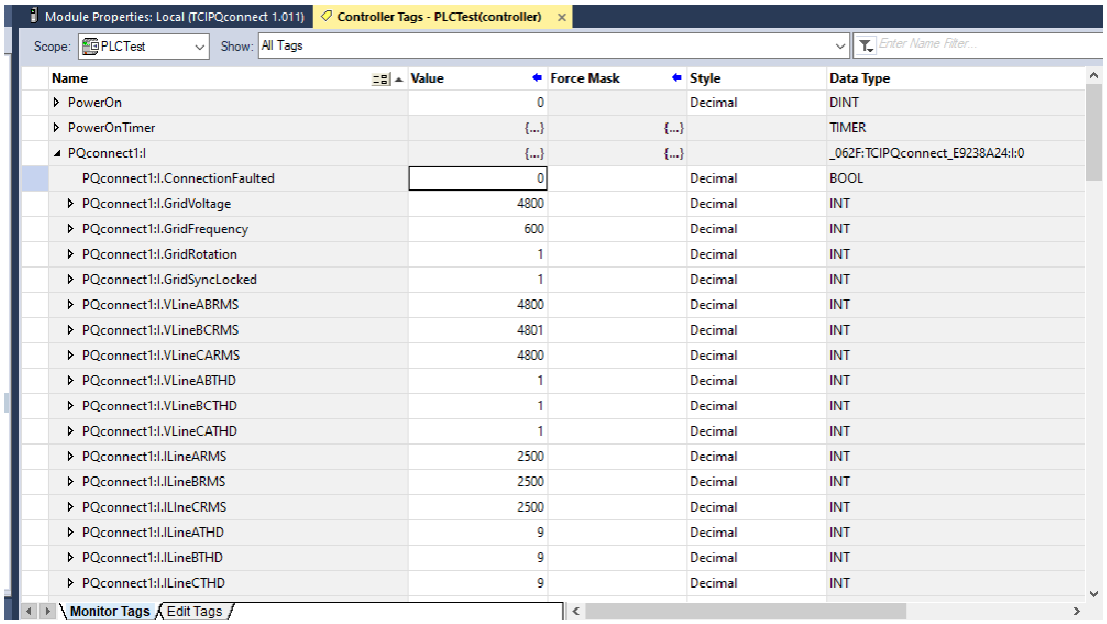


Figure 53: PQconnect in Data Simulation Mode

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.

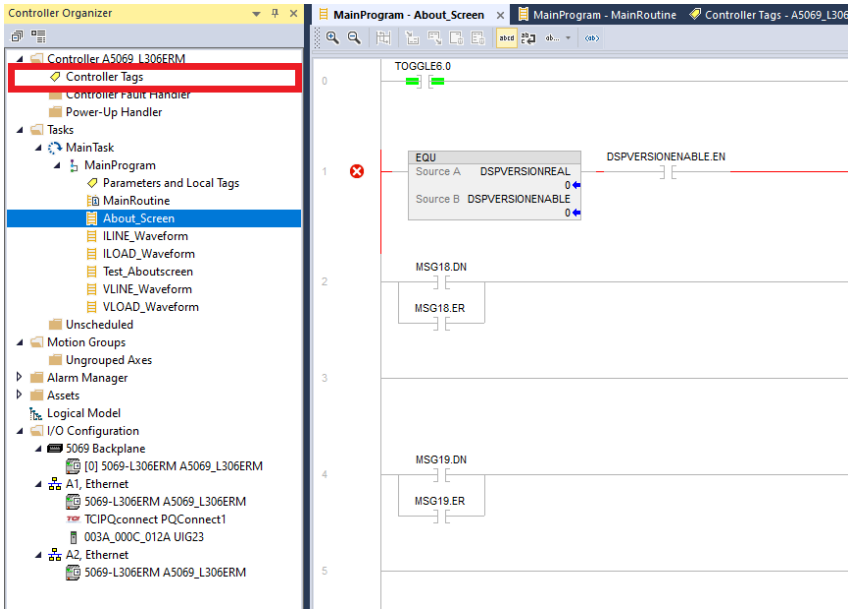


Figure 54: About Screen

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.

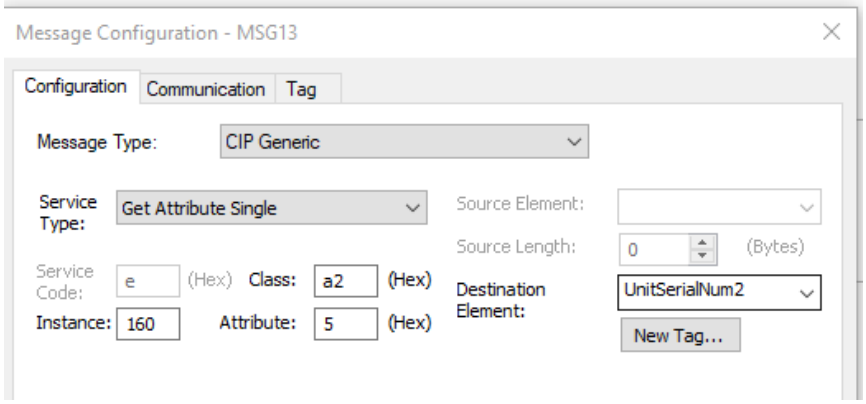


Figure 55: Message Block Configuration

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:

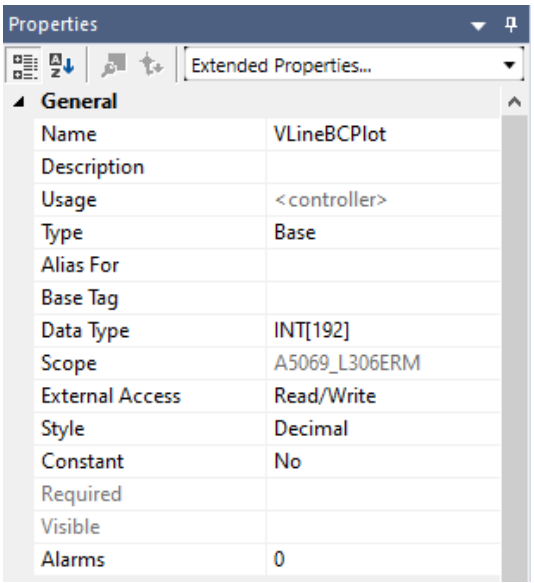


Figure 56: VLineBCPlot for Read/Write

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.

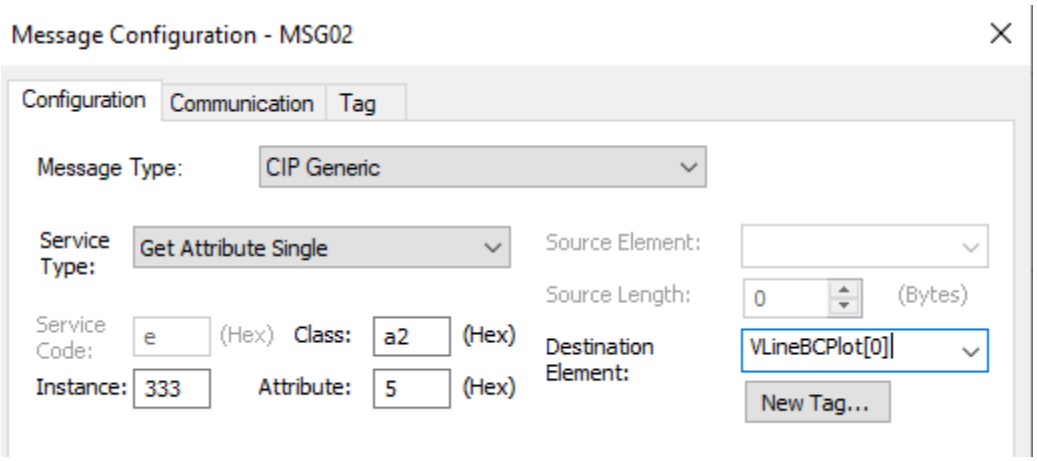


Figure 57: VLineBCPlot Waveform Array Example

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.**

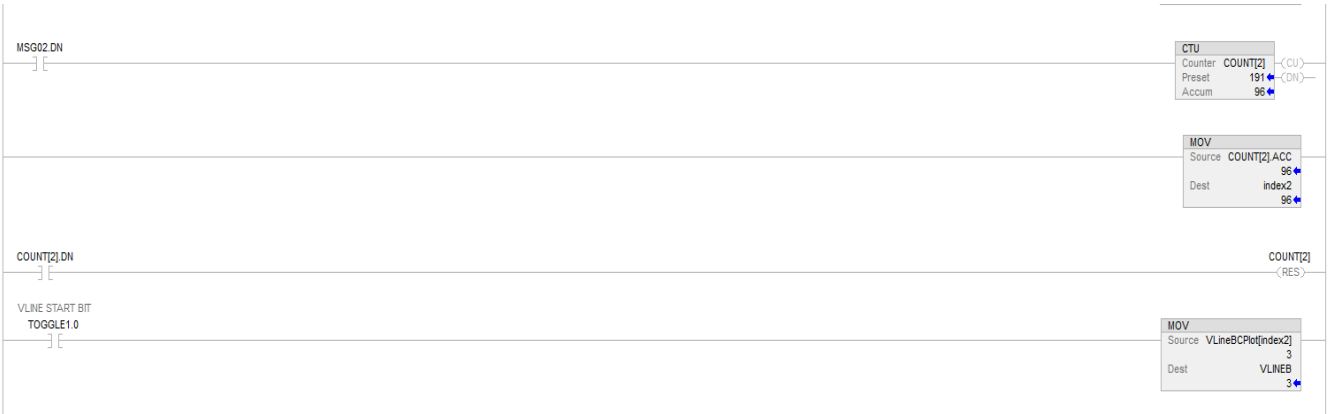


Figure 58: Sample Ladder Logic for VLineBCPlot

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 37 : 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 9 = Save Current Values to Flash 21 = Set User Access 25 = Set Access to Tech Access (access key needs to be set to 125 for key A and 60014 for key B) 100 = Clear History Log 150 = Load Values from Flash 200 = Restore Defaults to Flash 300 = Restore Calibration Defaults
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	**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_LINE (LineStatusActive)	281	Line status detection active bit mask	R	Default:0	
STATUS_FILTER_LOAD (LoadStatusActive)	282	Filter load status detection bit mask	R	Default:0	
STATUS_FILTER_A_ENABLE_RO (FilterStatusEnabledA)	283	Filter status A detection enable bit mask	R	Default:0	
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	
STATUS_FILTER_LOAD_ENABLE_RO (LoadStatusEnabled)	286	Filter load status detection enable bit mask	R	Default:0	
PARAM_STATE (ParamState)	287	Parameter state	R	Default:0	Indicates the present state of the parameter state machine - Read only value 0-11, 13-17 = restore, parameter load, save, reboot in progress. 12 = parameter load complete
SYS_STATE (SysState)	288	System state	R	Default:0	Indicates the present state of the system state machine 0,1 = Initialization 2 = Power on Delay 3 = Unit Self State Inhibit 4 = Reset 5 = Force Open Contactor 6 = Force Close Contactor 7 = Auto Load Open 8 = Auto Load Close 9 = 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 = Calibrate Check
CNT_STATUS (CntStatus)	289	Contactor command status	R	Default:0	

RELAY_INPUT_STATUS (RelayInputStatus)	290	Digital relay input status	R	Default:0	Filter Relay Input Status 0 =Enabled 1 = Disabled
FIELDBUS_STATUS_A (FBStatusA)	294	Field Bus communication status A Register	R	Default:0	
FIELDBUS_STATUS_B (FBStatusB)	295	Field Bus communication status B Register	R	Default:0	
SYS_NULL_STAT (PCBCalStatus)	296	Factory PCB calibration status	R	Default:0	System Calibration Status Read-only 0 = Not Calibrated 1 = Unit Calibrated
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	
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
STATUS_FILTER_B_RELAY_ACTION (FilterStatusRelayBEn)	16	Filter status B relay action enable bit mask	R/W	Default:49151 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
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
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
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

STATUS_FILTER_B_CNT_ACTION (FilterStatusCntBEn)	20	Filter status B tune contactor action enable bit mask	R/W	Default:36863 Range:0 to 65535	**Reference Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal
STATUS_LINE_CNT_ACTION (LineStatusCntEn)	21	Line status tune contactor action enable bit mask	R/W	Default:64 Range:0 to 65535	
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 Filter Status Table in IOM** To enabled desired status detections, enter bit mask from table by converting to decimal

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 38 : 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 0x0141 = ASCII for "A1"
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	
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. (10 = 1.0 Volts)	R	Default:0	Filter Input Voltage
LINE_FREQ (GridFrequency)	216	Utility grid frequency (10 = 1.0 Hz)	R	Default:0	Filter Input Frequency
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	
CURRENT_WAVEFORM_ DATA_FORMAT (WaveformFormat)	7	Waveform data format, (10=1.0A or per unit with base of 16384 counts)	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. (10 = 1.0 Amps)	R/W	Default:2500 Range:30 to 15000	Filter rated Current Range: 3 to 1500 Arms
RATED_VOLTAGE (RatedVoltage)	11	Unit rated voltage, (10 = 1.0 Volts)	R/W	Default:4800 Range:1200 to 6900	Filter Rated Voltage Range: 120 to 690 Vrms
RATED_FREQUENCY (RatedFreq)	12	Unit rated utility grid frequency, (Hz)	R/W	Default:60 Range:50 to 60	Filter Rated Frequency

RELAY_INPUT_1_CONFIG (Relay1Config)	40	Relay input 1 configuration	R/W	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_NUM_0 (PCBSerialNum0)	164	Lower 16 bits of the PCB serial number	R/W	Default:0 Range:0 to 65535	
PCB_TEST_NUM (PCBTestNum)	165	Test number of the PCB serial number	R/W	Default:0 Range:0 to 65535	
RATED_STEP_1_CAP (RatedStepCap1)	181	Unit rated capacitance for tune step 1, (10 = 0.1uFarad)	R/W	Default:575 Range:0 to 20000	Filter rated (step 1) capacitance Used for tune circuit no load current
RATED_STEP_2_CAP (RatedStepCap2)	182	Unit rated capacitance for tune step 2, (10 = 0.1uFarad)	R/W	Default:0 Range:0 to 20000	Filter rated (step 2) capacitance. (Only used for filters with dual tuned circuits) Used for tune circuit no load current
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 HarmonicGuard 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 39: 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, (10 = 1.0 deg C)	R	Default:0 Range: -40C to 75C	Board will give a status condition of overtempt if it exceeds 75C or under if the temperature descends past -40C
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	
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) 0 = Unit is not in Calibration Mode 1 = Unit is in Calibration Mode
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. 9 = Save Current Values to Flash 21 = Set User Access 25 = Set Access to Tech Access (access key needs to be set to 125 for key A and 60014 for key B)

					150 = Load Values from Flash 200 = Restore Defaults to Flash 300 = Restore Calibration Defaults
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 keep contactor always off/on, auto turn on/off based on desired load percentage or kVAR, external relay input. 0 = Always Open 1 = Always Closed 2= Auto load 3 = Auto kVAR 4 = External Control Input 5 = No contactor
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, (% rated current)	R/W	Default:30 Range:10 to 100	Contactor close threshold in percent rated current*
CNT_CLOSE_LOAD_HYSTERESIS (CntCloseLoadHys)	24	Contactor close/open hysteresis in load control mode, (% rated current)	R/W	Default:5 Range:2 to 50	Contactor will open when it reaches the hysteresis *
CNT_CLOSE_DELAY (CntCloseDelay)	27	Contactor close delay time, (sec)	R/W	Default:5 Range:1 to 3600	
CNT_OPEN_DELAY (CntOpenDelay)	28	Contactor open delay time, (sec)	R/W	Default:5 Range:1 to 3600	
CNT_AUTO_RECLOSE_DELAY (CntAutoReCloseDelay)	31	Contactor auto re-close delay time, (sec)	R/W	Default:10 Range:120 to 65535	
CNT_POWER_ON_DELAY (PowerOnDelay)	32	System power on start delay time, (sec)	R/W	Default:1 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:10 Range:10 to 300	
SYS_NULL_EN (PCBCalEn)	119	Factory PCB calibration enable	R/W	Default:0 Range:0 to 1	
SYS_CPU_THRESHOLD (CtrlFaultOnset)	159	Controls Processor fault threshold	R/W	Default:12369 Range:0 to 10000	
FIELD_BUS_COMMAND (FBCmd)	180	Field Bus communication module command input	R/W	Default:0 Range:0 to 255	
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 40 : 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
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	Read/write parameters under Tech Access
PARAM_KEY_B (ParamKeyB)	5	Parameter access key value B	R/W	Default:0 Range:0 to 65535	Read/write parameters under Tech Access
MB_SLAVE_ADDRESS (ModbusDeviceID)	35	ModbusRTU device server address	R/W	Default:10 Range:1 to 247	Modbus Slave Address
MB_BAUD_RATE (ModbusBaud)	36	ModbusRTU device baud rate, (bits per second)	R/W	Default:11520 Range:0 to 11520	Modbus Baud Rate Default: 11520 = 115200 baud rate 960 = 9600 baud rate 3840 = 38400 baud rate
MB_PARITY (ModbusParity)	37	ModbusRTU 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	
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 9999	
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 41 : 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: -99 to 1000	Filter input Displacement Power Factor – Negative value indicates lagging power factor. 1,000 = 1.00 Unity PF -95 = 0.95 Lagging PF 95 = 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: 0 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: -99 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, (100 = 1.0)	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, (100 = 1.0)	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 42 : 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 43 : 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, (10 = 1.0%)	R	Default:0	
V_LINE_BC_THD (VLineBCTHD)	223	Line voltage phase BC THD, (10 = 1.0%)	R	Default:0	
V_LINE_CA_THD (VLineCATHD)	224	Line voltage phase CA THD, (10 = 1.0%)	R	Default:0	
V_LOAD_AB_THD (VLoadABTHD)	237	Load voltage phase AB THD, (10 = 1.0%)	R	Default:0	
V_LOAD_BC_THD (VLoadBCTHD)	238	Load voltage phase BC THD, (10 = 1.0%)	R	Default:0	
V_LOAD_CA_THD (VLoadCATHD)	239	Load voltage phase CA THD, (10 = 1.0%)	R	Default:0	
V_TUNE_A_THD (VTuneABTHD)	249	Tuned circuit voltage phase AB THD, (10 = 1.0%)	R	Default:0	
V_TUNE_B_THD (VTuneBCTHD)	250	Tuned circuit voltage phase BC THD, (10 = 1.0%)	R	Default:0	
V_TUNE_C_THD (VTuneCATHD)	251	Tuned circuit voltage phase CA THD, (10 = 1.0%)	R	Default:0	
FAULT_HIGH_THD_ONSET (VLineHighTHDOnset)	71	Voltage THD high onset threshold, (Percent rated voltage)	R/W	Default:80 Range:20 to 200	
FAULT_HIGH_THD_CLEAR (VLineHighTHDClear)	72	Voltage THD high clear threshold, (Percent rated voltage)	R/W	Default:110 Range:20 to 200	
FAULT_HIGH_THD_DELAY (VLineHighTHDDelay)	73	Voltage THD high delay time, (sec)	R/W	Default:3 Range:1 to 3600	
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 44 : 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 45 ; 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 46 : 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 47 : 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 1000 = 1000:5 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 48 : 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 state 0 = Calibration Command not active 1 = Enter calibration state
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 49 : 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 50 : 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:100 to 150	
V_LINE_UV_CLEAR (VLineUVClear)	47	Undervoltage phase loss clear threshold, (percent rated voltage)	R/W	Default:80 Range:90 to 140	
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_CURREN T (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 by 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 51 : 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	
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	DataSim Parameter
TEST_FREQUENCY (TestFreq)	14	Unit test frequency, (Hz)	R/W	Default:0 Range:0 to 60	DataSim Parameter
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	
DIAGONSTIC_FEEDBACK_1 (DiagFb1)	313	Diagnostic Feedback Parameter 1	R	Default:0	**EtherNet Only: Reserved Does not exist in Database.**
DIAGONSTIC_FEEDBACK_2 (DiagFb2)	314	Diagnostic Feedback Parameter 2	R	Default:0	
DIAGONSTIC_FEEDBACK_3 (DiagFb3)	315	Diagnostic Feedback Parameter 3	R	Default:0	
DIAGONSTIC_FEEDBACK_4 (DiagFb4)	316	Diagnostic Feedback Parameter 4	R	Default:0	
DIAGONSTIC_FEEDBACK_5 (DiagFb5)	317	Diagnostic Feedback Parameter 5	R	Default:0	

DIAGONSTIC_FEEDBACK_6 (DiagFb6)	318	Diagnostic Feedback Parameter 6	R	Default:0	Parameter maps to SYS_CNT_MIN_OFF_TIMER Explicit write parameter for reading minimum off time.
DIAGONSTIC_FEEDBACK_7 (DiagFb7)	319	Diagnostic Feedback Parameter 7	R	Default:0	Parameter maps to PARAM_ACCESS_LEVEL_RO Explicit write parameter for reading parameter access level.
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 7	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 52 : 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 = Undef 3 = Sim 101 = HSD 102 = HGL 103 = HGP 104 = HSL 200 = KIT
HMS_MODEL_NUM_RO (FBModelNum)	210	Fieldbus communications processor model number	R	Default:0	Software Revision code for the Bluetooth module Two 8bit ASCII Characters 0x0141 = ASCII for “A1”
BGM_MODEL_NUM_RO (WLModelNum)	212	Wireless communications firmware model number	R	Default:0	

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 53 : 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 54 : 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 55 : 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.

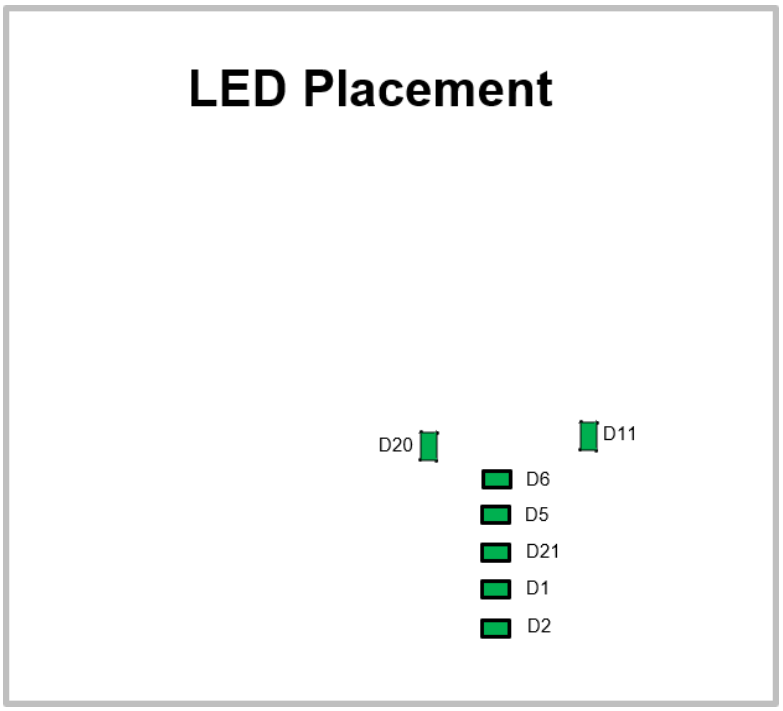


Figure 59: PQconnect LED Placements

Table 56: 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.*

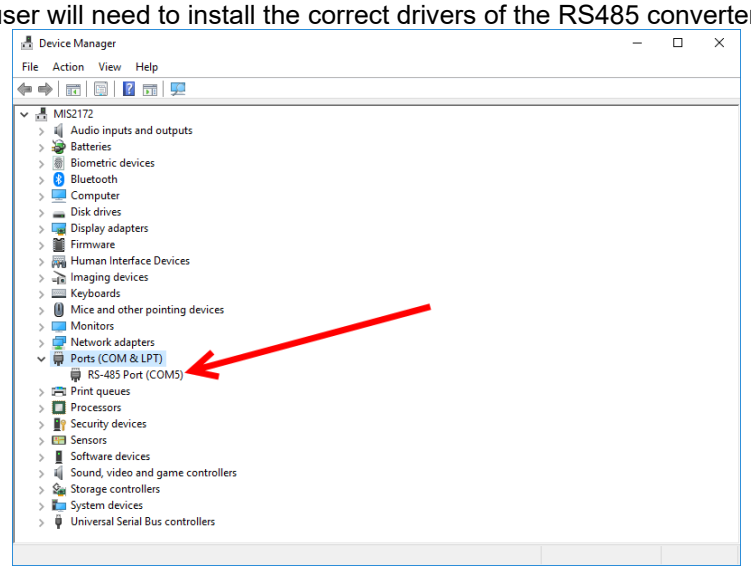
The table below shows the specified blinks for each status condition.

Table 57: Specified Blinks for Each Status Condition

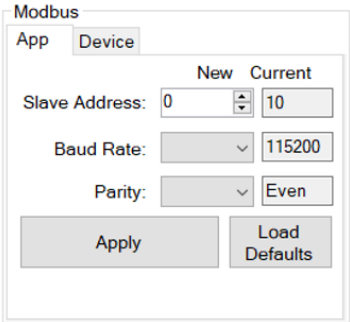
Status Condition	Group (Slow blinks)	LED Specifier (Fast Blinks)
Tune Phase A Loss	2	1
Tune Phase B Loss		2
Overvoltage Phase C		3
Tune Balance Loss Phase A		4
Tune Balance Loss Phase B		5
Tune Balance Loss Phase C		6
Tune Undercurrent Phase A		7
Tune Undercurrent Phase B		8
Tune Undercurrent Phase C		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 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 58 : 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 59: 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 59: 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 60 : 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 61 : 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.

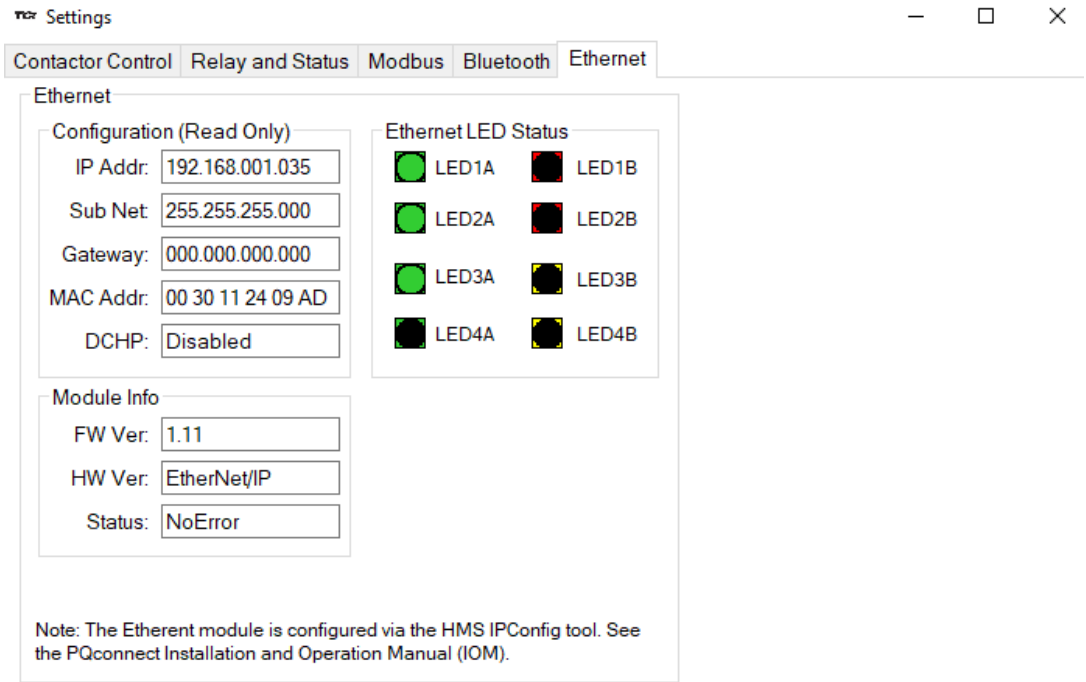


Figure 60: LED Status Codes

Table 62 : 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)

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