

HPS TruWave Active Harmonic Filter (AHF) Quick Start Instructions

These instructions will guide you through installing, testing your installation, and starting up your AHF. For additional information please refer to the owner manual provided with your AHF.



HPS TruWave™ 

The pictures used in this guide are only a representation and may vary from the actual product.

Disclaimer of Liability

The recommended practices in this manual are for general applications and are supplied without liability for errors or omissions. Technical data are subject to change at any time without notice and any necessary corrections will be included in subsequent editions.

Special requirements should be referenced back to the manufacturer and/or their representative.



WARNINGS

These instructions will guide you through installing, testing your installation, and starting up your AHF. For additional information please refer to the owner manual provided with your AHF.

Installation of a AHF should only be performed by qualified personnel.

Refer to the sections of the Owner's Manual referenced in the early steps of this procedure to install the AHF. The safety precautions of Section 2 in the manual should be read and understood prior to attempting an installation or prior to opening a AHF enclosure any time after installation.

All wiring should meet the National Electric Code and any applicable local standards.

The circuit from which the power leads to the AHF originate should be off and locked out during installation.

The power source powering the wires monitored by the external current transformers (CTs) should also be off and locked out during installation of the CTs. Only after CTs are properly terminated to the AHF (or to all AHFs in a paralleled arrangement) should the power source powering the wires monitored by the CTs be re-energized.

Do not open the output circuit of a current transformer (CT) unless the circuit the CT monitoring is de-energized or the CT has been physically removed from the circuit. This includes not removing any connections from, or the connectors themselves from P1 or P2 of the CT Interface boards inside the AHFs. Opening the output circuit of a CT could result in very high voltage that can cause the CT to fail and represents an extremely dangerous condition to personnel. Exception: If CTs are first connected to a shorting terminal block prior to being wired to a AHF, and shorts are applied across each CT's pair of output wires on that block, then CT related wiring continuing from the block to the AHF may be opened without harm.

Important Note:

Electrical equipment should be installed, operated, serviced, and maintained, only by qualified personnel. No responsibility is assumed by the manufacturer for any consequences arising out of the use of this material.

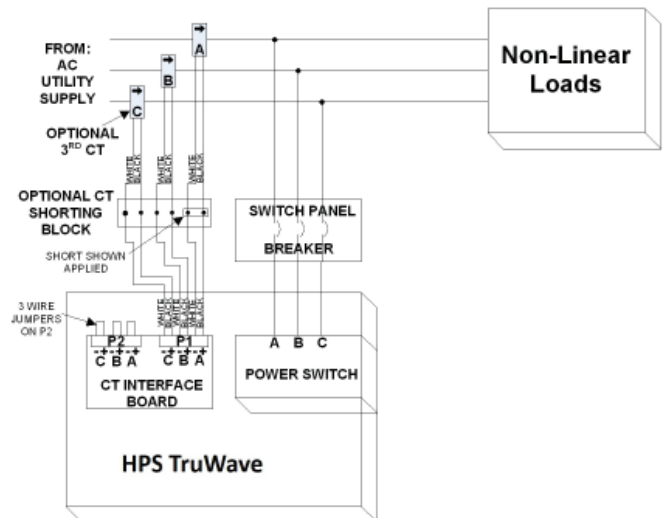
1. Read Section 1 in the manual to familiarize yourself with how the AHF filters harmonic currents and power saving features of the HPS AHF.
2. Read Section 2 in the manual to see the safety precautions to follow when working on a AHF.
3. Section 3 in the manual covers the installation of the system. Within this section, subsection 3.2 covers the installation of a NEMA1 enclosed unit and subsection 3.3 covers the installation of a panel within a site-specified enclosure, such as an MCC cabinet.
4. Subsection 3.4 covers how to wire a AHF. All systems will need 3-phase power brought into the unit. Also, either 2 or 3 Current transformers (CTs) are needed to externally monitor either the "Line" side current or "Load" side current. Examples are shown below.

Refer to section 3.4 of the manual if CT wires need to be lengthened or for additional wiring arrangements, especially arrangements that use paralleled AHFs.

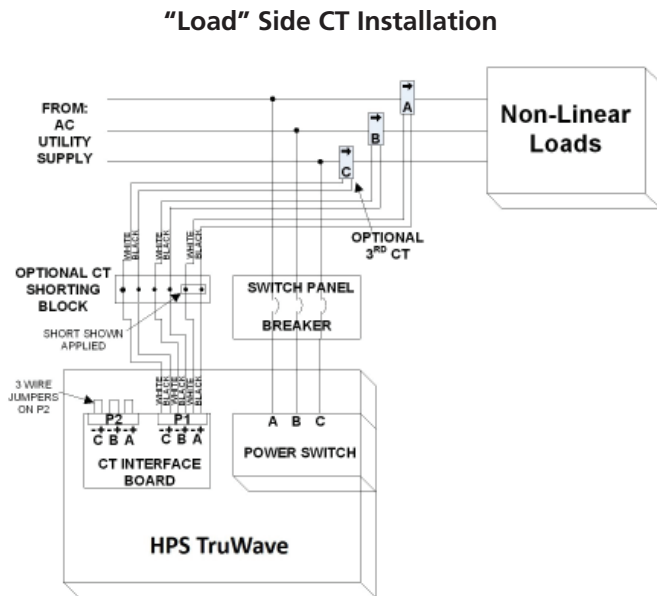
You may use these Quick Start Instructions for a paralleled system; however, you will need to also read subsection 3.4.3 in the manual for wiring instructions. Each system in the paralleled arrangement should be checked individually with the other AHF(s) powered off.

An example of a "Line" side wired installation follows:

"Line" Side CT Installation



An example of a “Load” side wired installation follows:



It is important to note that the CTs are in the correct direction and on the correct phases. The direction of the arrows on the CTs should agree with the direction of the arrows in the previous Installation drawings. If using CTs supplied from HPS, the output wires of the CTs are black and white twisted wires, and must be wired to the CT Interface Board inside the AHF as shown.

The phase “A” CT must be on the same phase that is connected to the left terminal of the AHF’s power switch (of a NEMA1 enclosed unit) or left power fuse block (of a panel unit). The phase “B” CT must be on the same phase that is connected to the middle terminal of the power switch or middle power fuse block. The phase “C” CT, if used, must be on the remaining phase.

ATTENTION: When using two CTs, always wire to terminals A and B of connector P1 on the CT Interface Board. The C terminal is only to be used if a third CT is utilized.

The designation of phase A, B, and C is arbitrary, and phase rotation does not affect the AHF.

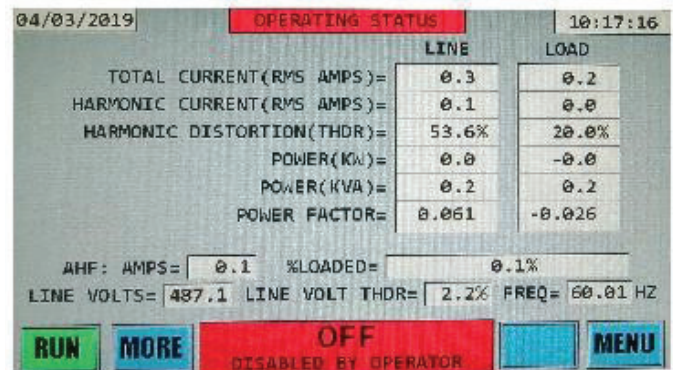
5. If status feedback relays are desired to be monitored by external hardware and/or the unit is to be externally disabled by external hardware, subsection 3.5 covers wiring to these optional features within the AHF.
6. Your AHF has the capability to automatically determine if your CTs are placed on the correct phases and in the correct direction. However, to do so, there must be some load operating. This load cannot be too inductive or capacitive in nature – one or more AC motor drives operating at 20% or greater than the capacity of the active filter is an excellent load. At this point a load would need to be turned on before you proceed.

7. Once your AHF is correctly installed and wired, the unit can be powered on. The unit will arrive from the factory in the “disabled” state. This means that the controls will power up, but the internal power circuitry will not yet operate.
8. When power is applied to the system by turning on the power switch, you should observe the following power-up “splash” display:

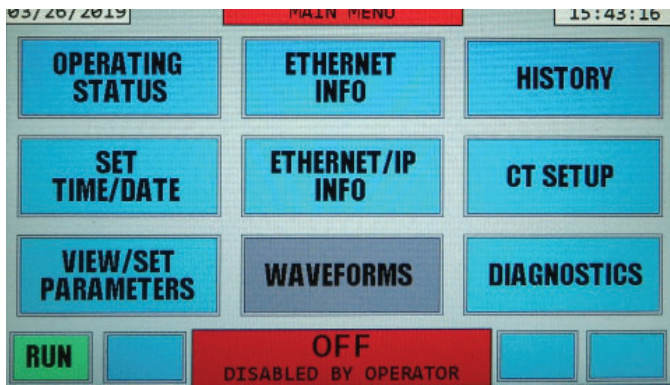


If you get the full display, you may either wait 5 seconds until the display changes to the “OPERATING STATUS” display or press the “STOP” button on the display to go to the “OPERATING STATUS” display immediately. DO NOT press the “RUN” button on the display at this time. If the display does not show anything, check to make sure 3-phase going to the AHF, or if is different than what is indicated above, contact the factory.

9. Once in the “OPERATING STATUS” display, press the “MENU” button to display the main menu on the LCD display:



10. The boxes around the words indicate that those items are buttons that can be pressed to activate that function. On the MENU display, press the “CT SETUP” button to go to the current transformer (CT) setup display. For more detailed information on the CT SETUP display, refer to section 4 in the manual.

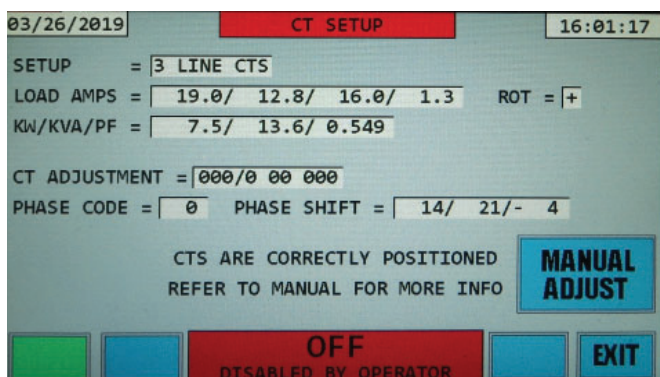


11. On the CT SETUP display, the 2nd line indicates how many CTs the system is programmed for (2 or 3), and whether the system is programmed for LINE or LOAD side CTs. Verify that the number of CTs indicated and the position (LINE or LOAD) agrees with the number of physical CTs and location of those CTs you have wired into your system. If not, you will need to either correct your physical wiring to match the AHF configuration shown, or change the AHF setup parameters. To change these parameters, press the “MENU” button on the display, followed by pressing the “VIEW/SET PARAMETERS” button on the MENU display. Then refer to sections 5.6, 5.6.2, and 5.6.7 to change the number of CTs and/or position (Line or Load) of those CTs.

The 3rd line shows how much current is presently being drawn by the load. The first 3 numbers, separated by “/” characters are the 3 phases A, B, and C. The 4th number indicates the neutral current. The neutral current is calculated by the AHF only for systems that have 3 CTs.

The 4th line shows the present real power in KW and apparent power in KVA, as well as the power factor of the load.

The 5th line titled “CT ADJUSTMENT” indicates any “programmed” adjustment that the AHF has been set up for to compensate for CTs that are not placed correctly.



As stated before, your AHF has the capability to automatically determine if your CTs are placed on the correct phases and in the correct direction. However, to do so, there must be some load operating. This load cannot be too inductive or capacitive in nature – one or more AC motor drives operating at 20% or greater than the capacity of the active filter is an excellent load.

The first number in the 6th line is the “Phase code”. This value will be “0” if your CTs are installed correctly. A non-zero code between -28 and 43 indicates the CTs are not on the correct phases and/or are in the wrong direction. At this point if you see a value other than zero you will need to refer to section 4 in the manual, tables 4.2 or 4.3.

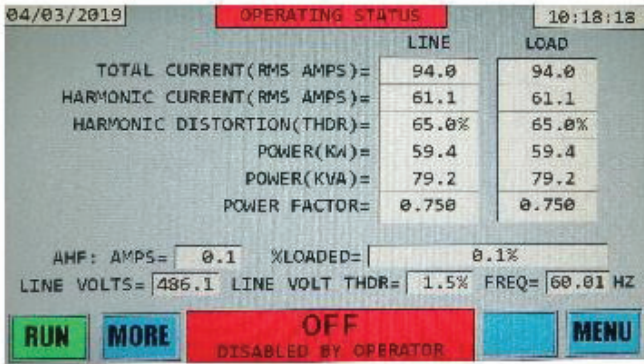
If the message on the 7th line is “CTS ARE CORRECTLY POSITIONED” or “CTS ARE CORRECTLY ADJUSTED”, your CTs are on the correct phases for proper operation and you can proceed to the next step.

If you observe any of the other messages in the following table, refer to Table 4.1 of the manual for information on how to correct the situation, and specifically go to the subsection of section 4 shown in the following table for the particular CT SETUP message displayed.

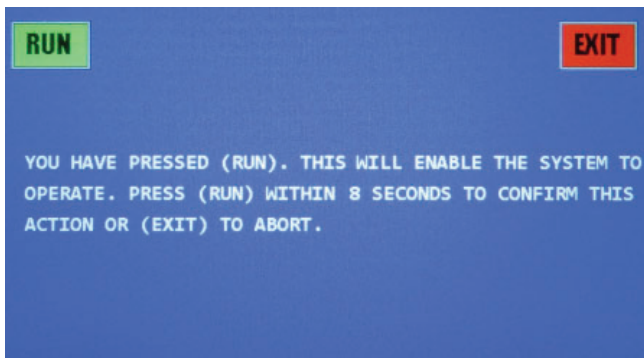
CT SETUP Message	Explanation and Action to Take
LOAD CURRENT TOO LOW	Insufficient load current to determine if CTs are placed correctly. Go to subsection 4.1 in the owners’ manual to correct.
LOAD TOO CAPACITIVE/ INDUCTIVE	Load current is high enough; however, load is either too capacitive or inductive to correctly determine if CTs are placed correctly. Go to subsection 4.1 in the owners’ manual to correct.
ERRONEOUS PHASE CODE	Should not see this message. Stop and contact factory if you do see it.
2 CTS ON A&C. MUST BE ON A&B	When using 2 CTs, they must be located on phases A and B. Go to subsection 4.2 in the owners’ manual to correct.
2 CTS ON B&C. MUST BE ON A&B	When using 2 CTs, they must be located on phases A and B. Go to subsection 4.2 in the owners’ manual to correct.
FIX CTS OR ADJUST HERE	CTs are not on the correct phases and/ or are in the wrong direction. Go to subsection 4.2 in the owners’ manual to correct.

Your AHF also has the capability to automatically correct for certain incorrect CT placements, without rewiring or moving CTs. Refer to section 4.2.3. of the manual in order to use this feature.

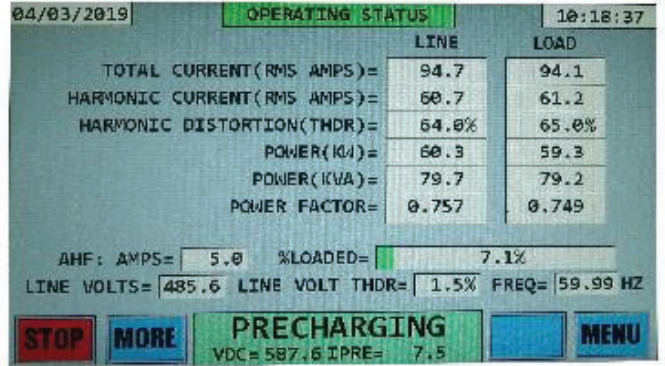
12. If the message “CTS ARE CORRECTLY POSITIONED” or “CTS ARE CORRECTLY ADJUSTED” is shown on the CT SETUP display, it is now time to enable the AHF to start correcting harmonics. Exit the CT SETUP display by pressing the MENU button in the bottom right corner of the display. Then press the OPERATING STATUS button on the MENU display to bring up the OPERATING STATUS display:



13. To enable the system, press the “RUN” button in the bottom left corner of the OPERATING STATUS LCD display page. This will result in the following display: This screen allows the operator to confirm the “RUN” command, or exit without enabling the system in case the “RUN” button was pressed accidentally. Pressing the “EXIT” button will bring up the previous display page without enabling the system. If the “RUN” button is not pressed within 10 seconds, the effect will be the same as pressing the “EXIT” button. If the “RUN” button is pressed within 10 seconds, the AHF system will be enabled and begin to operate.

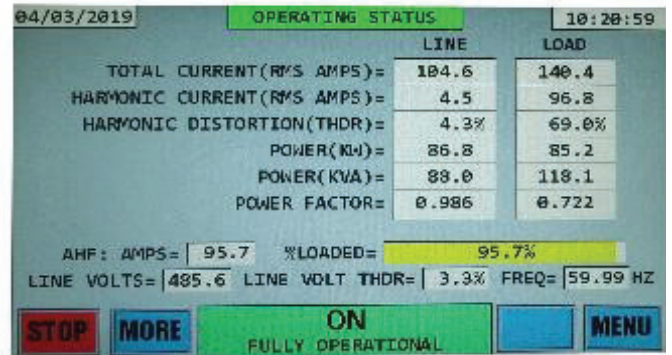


14. The AHF will begin charging the internal DC bus, which takes 1 to 10 seconds depending on AHF size. This is indicated by a “PRECHARGING” message on the display. The pre-charging voltage and current are displayed at the bottom of the screen. This can be seen in the sample screen that follows.



Note that once the AHF is told to RUN, the place where the RUN button was previously located, is now a STOP button.

15. When the DC voltage bus has been completely pre-charged and the control determines it is OK to proceed, the AHF begins correcting the harmonics and power factor of the line, and the display will indicate that the unit is operating. This is indicated by the “ON”/“FULLY OPERATIONAL” or “ON”/“REDUCED LINEAR PF MODE” status.



If the system is working correctly, the LOAD THDR% (total harmonic current distortion of the current fed to the loads) will still be relatively high (66.9% in this example); however, the LINE THDR% (total harmonic current distortion of the current drawn from the line) will be low (3.9% in this example). For most loads and line conditions, as long as the AHF is loaded to at least 25% (98.5% in this 100 Amp AHF example as seen in the AHF % LOADED line), you should be able to achieve less than 5% THDR% on the LINE. The load requiring more harmonic current correction than the unit can deliver, very high THDR loads, highly distorted line voltage, or high impedance in the line feeds could result in a higher THDR% from the line.

If substantially lower THDR% is not observed in the LINE THDR% displayed compared with the LOAD THDR% and the AHF is loaded to at least 10%, you probably have an installation problem. Disable the AHF by pressing the STOP button. When the next display asks you to confirm the STOP command, press the

STOP button on that display as well.

If the unit detects that it is not correcting harmonics satisfactorily, it may shut itself down. It will then attempt to reset (indicated by the splash screen being displayed). It could perform this cycle a few times before "giving up". If it reaches this point, the OPERATING STATUS display will indicate a status of OFF and the reason for the problem underneath this OFF status.

Even if your CTs are placed on the correct lines and in the correct direction, if you have them placed on the LOAD side, but have told the AHF they are on the LINE side, or vice-versa, the system will not operate correctly. This is the most likely reason for your AHF to not be operating correctly at this time. Recheck your CT locations. If all CTs and settings seem to be correct, consult the factory for additional assistance.

16. Once you have confirmed that your CTs are correctly placed, and the unit is operating properly, the AHF should give you years of trouble-free, harmonic-correcting operation, requiring minimal maintenance. To insure a long life for your unit, regularly inspect the air filter(s) on the front and/or bottom of the unit and clean or change when dirty.

For Parallel AHF Installation Only:

After each AHF has been tested, they may now be powered and enabled to run. Once running, the THDR% of the line should again be substantially lower than the THDR% of the load for all AHFs in the paralleled setup. It should be noted that actual THDR% of the line will only be equal to the line THDR% shown on any of the paralleled AHFs if all AHFs are operating and %LOAD values (see subsection 3.4.3 of the manual) for all paralleled operating AHFs add up to 100%.