Power Genius XL
User Guide

Power Genius XL Firmware Version 3.8.4
Power Genius XL Utility Version 3.8.4
18 August 2023

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1 Important Notice

WARNING!

This Radio Frequency (RF) power amplifier is designed to operate on frequencies designated for amateur radio service. You are required to have a valid amateur radio license to operate on these frequencies.

Please operate this amplifier only by following the quick start guide's instructions and this user guide. The unit must only be opened or serviced by a qualified technician.

RF energy from transmitters can interact with some electronic devices, such as cardiac pacemakers and defibrillators. Please refer to the pacemaker or defibrillator manufacturer's instructions concerning the precautions to be taken near an amateur radio transmitter. If any interaction or interference with a pacemaker or defibrillator is suspected, **STOP** transmitting immediately.

! - WARNING!

▲- Caution

i – Information

! – This unit is NOT A TOY. It must not be handled by children nor placed/operated within reach of children.

! – Do not leave packing material for this unit unattended. It may be harmful to children if misused.

! – This unit contains small parts that could be a choking hazard to small children. Do not leave accessories unattended.

! – Do not operate this unit in potentially explosive environments.

! – Never attempt to insert wires or any tools into the interior of this unit during operation. This may cause fire, electric shock, or death!

! – This unit must only be operated with the electrical power described in this User Guide. Doing otherwise may cause a fire, injury, or electrical shock.

! – Never connect or disconnect antennas while in TRANSMIT mode. This may cause electrical shock or RF burns and damage to the unit.

! – This unit generates high levels of Radio Frequency (RF) energy. Use caution and observe proper safety practices regarding your system configuration. When attached to an antenna, this amplifier can generate RF electromagnetic fields, which require evaluation according to your national law to provide any necessary isolation or protection required, concerning human exposure.

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▲- This unit must only be opened and serviced by a qualified technician. Opening the unit may void the manufacturer's warranty.

▲- Do not operate this unit in areas of extreme humidity.

▲- Avoid operating this amplifier in direct sunlight or other areas of extreme heat, excessive vibration, or mechanical force.

▲- If this unit is intended for use in ICAS commercial applications, special safety regulations and cautions may apply to prevent accidents.

▲- If any defect, abnormal result, or other observations occur that are not covered by this User Guide, immediately cease operation and contact FlexRadio Support or local distributor for operational advice or repair of the unit.

i – No physical modification of this amplifier is allowed. Any other use or modification (including software changes that affect operational characteristics) will void the manufacturer's warranty.

i – Ensure proper ventilation around the amplifier; This includes 30 cm (12 inches) clearance in front and back.

i – Please study the complete User Guide. This document contains important information regarding the safe operation of this unit. If you have any questions, please contact the manufacturer or local distributor for details.

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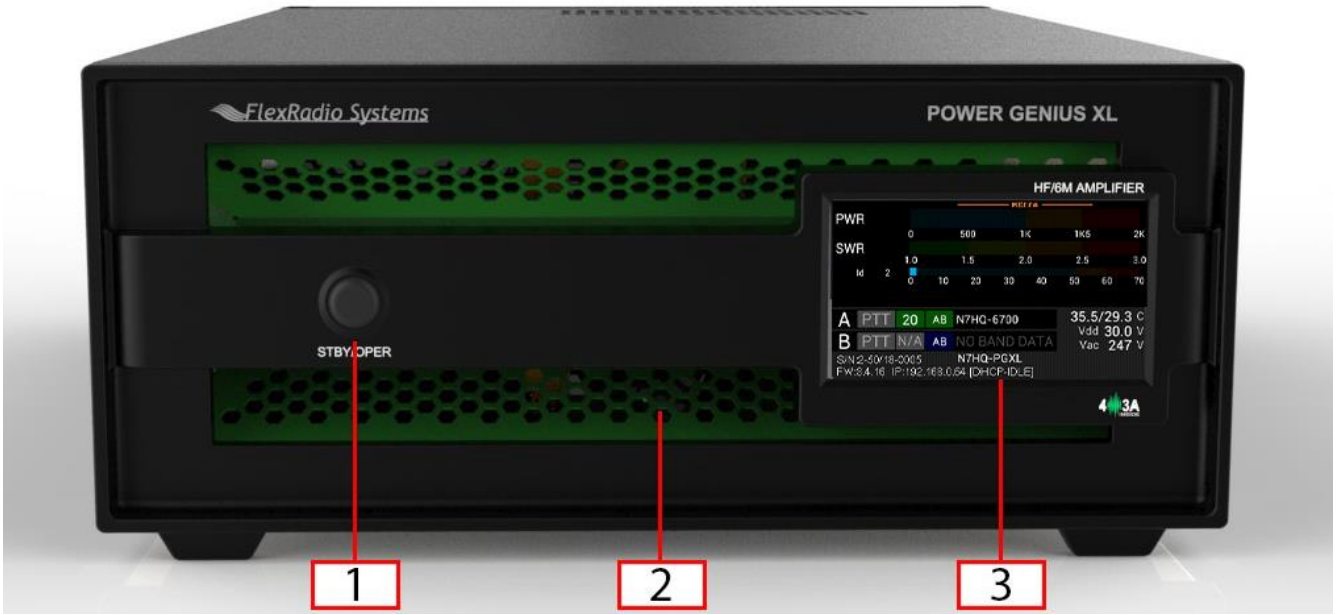
2 Features of the Power Genius XL

- Full legal power on all HF bands and 6M in all modes. 1500W ICAS with headroom for 2000W
- Unique Maximum Efficiency Algorithm (MEffA™) for efficiencies up to 75%
- Duplexed filters maximize harmonic suppression and efficiency
- Fully SO2R capable – 70dB nominal isolation between exciter inputs
- Automatic Power Control (APC) for ultra-fast SWR protection
- Remote control with desktop application in LAN or WAN environments

2.1 Front Panel

Designed to be easy to use and intuitive, the front panel consists of three elements:



1	**Standby / Operate button**
2	**RGB LED Backlight**
3	**LCD Touchscreen Display**

Pressing the **STBY/OPER** button toggles the amplifier between **STANDBY** and **OPERATE** modes. The LCD Touchscreen Display shows all the essential data for monitoring the amplifier while in operation and can be used to configure the amplifier. See section **4, Operating the Power Genius XL** for details.

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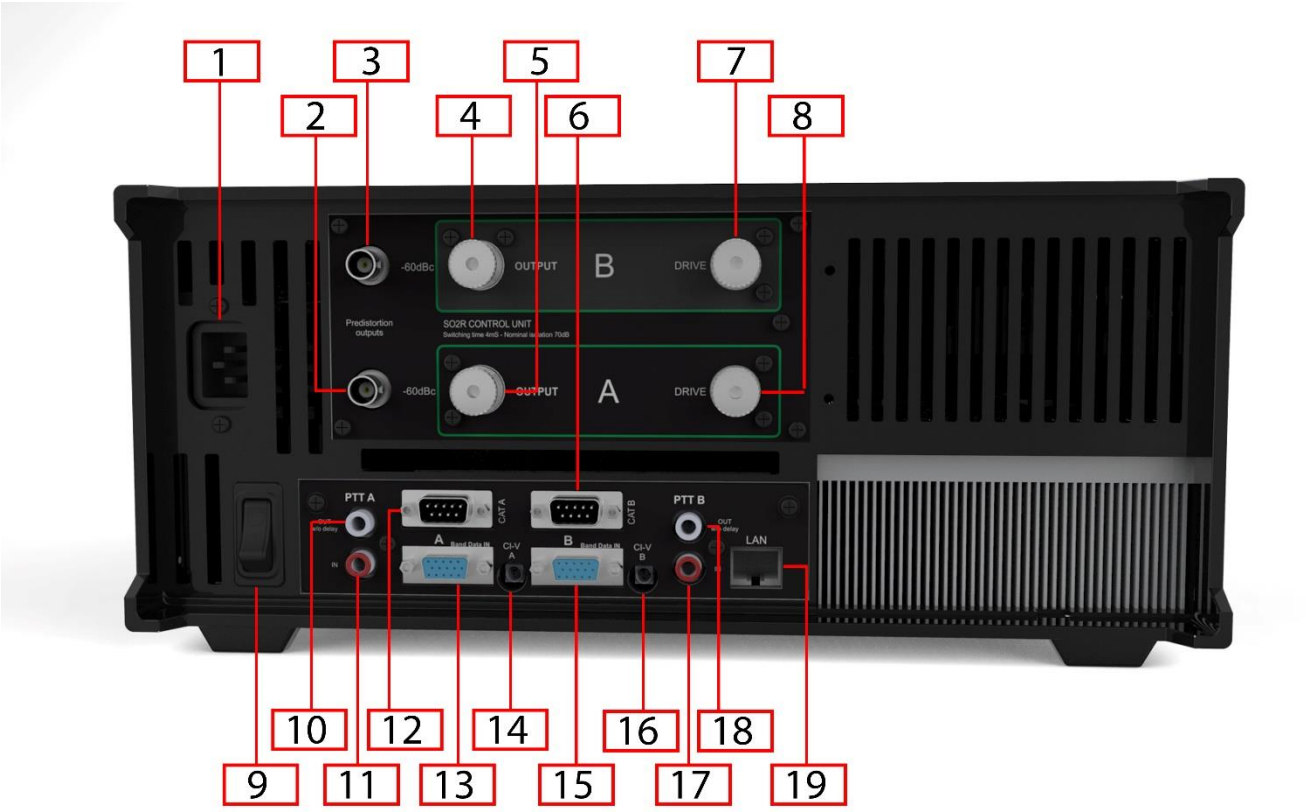
2.2 Back Panel

The back-panel connectors are logically divided into two groups, the A port connectors, and the B port connectors. The amplifier will amplify the signal on the A input and output it on the A output, or it will amplify the signal on the B input and output it on the B output. The A and B sections of the amplifier can be controlled independently by two radios. Separate A and B keying inputs (Push-To-Talk, PTT) and band data inputs are provided. At any point in time either of the A or B sections can be keyed, but they cannot be keyed simultaneously.



Please refer to the table below.

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1	**AC Power input:** 90-250V AC, 50/60 Hz
2	**RF Adaptive predistortion A output**: BNC female connector, -60dBc output signal, connects to radio A's adaptive predistortion input.
3	**RF Adaptive predistortion B output**: BNC female connector, -60dBc output signal, connects to radio B's adaptive predistortion input.
4	**RF Output B**: SO239 connector for connecting an antenna
5	**RF Output A**: SO239 connector for connecting an antenna
6	**CAT Input B**: Opto-isolated male DB9 connector for radio B CAT command input.
7	**RF Drive B**: SO239 connector for connecting radio B
8	**RF Drive A**: SO239 connector for connecting radio A
9	**Power Switch**: Switches input power ON or OFF
10	**PTT Output A**: Opto-isolated female RCA connector. The center pin is grounded when section A of the amplifier is keyed and ready to accept RF drive. *See section **3.5, Required RF Output Delay (TX Delay)** for usage details.*
11	**PTT Input A**: Opto-isolated female RCA connector. Ground the center pin to shield to engage PTT for the A section of the amplifier. *See section **3.5, Required RF Output Delay (TX Delay)** for usage details.*
12	**CAT Input A**: Opto-isolated male DB9 connector for radio A CAT command input
13	**BCD/PTB Input A**: Opto-isolated DE-15 female connector for radio A band data
14	**CI-V Input A**: Opto-isolated 3.5mm female connector for Icom radio A band data
15	**BCD/PTB Input B**: Opto-isolated DE-15 female connector for radio B band data
16	**CI-V Input B**: Opto-isolated 3.5mm female connector for Icom radio B band data
17	**PTT Input B**: Opto-isolated female RCA connector. Ground the center pin to shield to engage PTT for the A section of the amplifier. *See section **3.5, Required RF Output Delay (TX Delay)** for usage details.*
18	**PTT Output B**: Opto-isolated female RCA connector. The center pin is grounded when section B of the amplifier is keyed and ready to accept RF drive. *See section **3.5, Required RF Output Delay (TX Delay)** for usage details.*
19	**Ethernet connection**: RJ45 Local Area Network Ethernet connection

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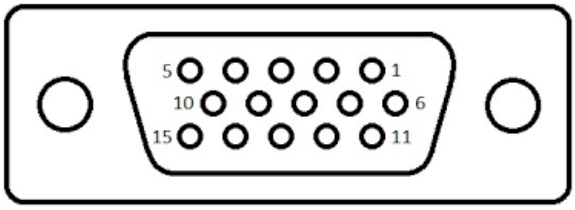
2.3 PTB/BCD Connector Pinout

PTB input – A 5 to 15-volt DC signal applied to one of the pins described in the following table selects a band and the appropriate filter. The pins are opto-isolated. Pin 15 is the signal ground.

Pin	Band	Frequency	Filter
1	160m	1.8 – 2.0 MHz	1
2	80m	3.5 – 4.0 MHz	2
3	40m	7.0 – 7.3 MHz	3
4	30m	10.10 – 10.15 MHz	4
5	20m	14.00 – 14.35 MHz	4
6	17m	18.068 – 18.168 MHz	5
7	15m	21.00 – 21.45 MHz	5
8	12m	24.89 – 24.99 MHz	5
9	10m	28.0 – 29.7 MHz	5
10	6m	50.0 – 54.0 MHz	6
15		Signal Ground	



i – The 60-meter band cannot be selected with this method.

BCD input – A 4-bit BCD signal (5 to 15-volt DC) selects a band and its filter. The pins are opto-isolated. Pin 15 is the signal ground.

The BCD inputs are designed for connection directly to a band decoder output provided by radios such as Yaesu and Elecraft.

Filter	1	2	3	4	4	5	5	5	5	6	NA
Band	160m	80m	40m	30m	20m	17m	15m	12m	10m	6m	None
Frequency	1.8	3.5	7	10	14	18	21	24	28	50	NA
Pin 11	H	L	H	L	H	L	H	L	H	L	L
Pin 12	L	H	H	L	L	H	H	L	L	H	L
Pin 13	L	L	L	H	H	H	H	L	L	L	L
Pin 14	L	L	L	L	L	L	L	H	H	H	L
Hex Value	1	2	3	4	5	6	7	8	9	A	0

i – The 60-meter band cannot be selected with this method.

Filters – The amplifier engages output filters using a BCD value; the table above shows which filter is selected for each value.

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3 Power Genius XL Setup, Configuration, and Testing

3.1 Unpacking and Initial Setup

The following accessories and materials are included with your Power Genius XL amplifier. Carefully remove the amplifier from its shipping container, unpack, and identify the items listed below:

- One (1) Power Genius XL amplifier
- One (1) 2.4m (8 ft.) AC power cord with C13 connector and pigtails
- One (1) 2m (6 ft.) Ethernet cable
- One (1) Power Genius XL User Guide

In addition to the above, the following are required for the initial setup of the amplifier:

- HF / 6-meter transceiver and antenna system
- Suitable coax jumper cables for interconnection of the transceiver and amplifier

Place your Power Genius XL on a flat, stable surface. Ensure the amplifier has at least 30cm (12 inches) of open space in front and back to provide adequate cooling. Follow these steps and refer to the following diagram to connect your Power Genius XL:

1. Connect the transceiver antenna output to the Port A **RF Drive** socket on the amplifier with a suitable coax jumper cable.
2. Connect the antenna to the Port A **RF Output** socket.
3. Apply an AC power plug to the power cable appropriate to your local electrical environment. Connect the cable to the AC power source[1] and plug the C13 connector into the back panel's power socket. The amplifier will accept 90 to 250 volts AC, 50 or 60 Hz. If powered by less than 200 volts, it will operate at a reduced maximum output power level (see section **4.6**, **120 VAC Operations** for details.)
4. Turn the amplifier on using the power switch on the back panel.
5. Verify that the amplifier starts correctly, as shown below.
6. Configure the amplifier for use following one of these procedures:
   6.1. If the amplifier will be used in a Local Area Network with FlexRadio Signature Series transceivers and with support from a Windows™ PC, follow the instructions in section **3.2**, **Configuring for use in FlexRadio environments**.
   6.2. If the amplifier will be used with a FlexRadio Signature Series “M Model” transceiver (6400M, 6600M), not on a Local Area Network, follow the instructions in section **3.3**, **Configuring for use with stand-alone FlexRadio M model transceivers.**
   6.3. In all other cases, follow the instructions in section **3.4**, **Configuring for Use with Other Exciters**.

[1] A dedicated 15-amp service with the proper circuit breaker wired per local, state or country codes or regulations.

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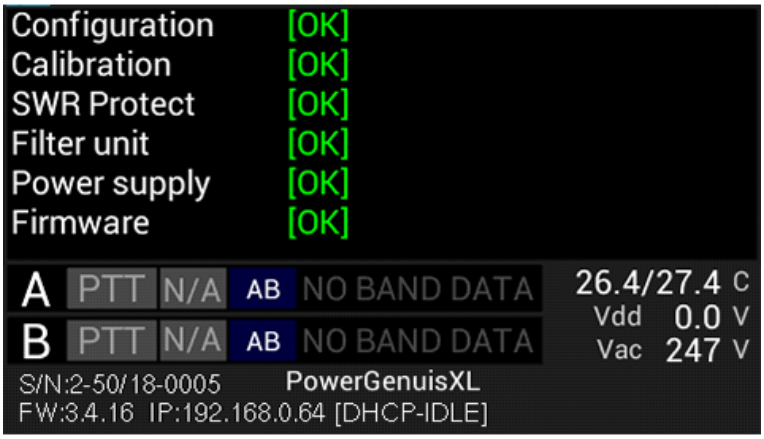
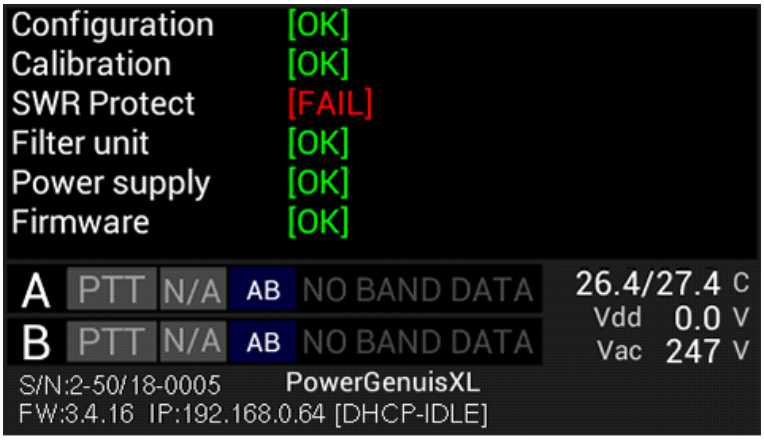
During power-up, the display will briefly show a splash screen like the following:

The amplifier will immediately conduct a power-on self-test (POST). The results of each test are displayed on the front panel. If any tests fail, the amplifier cannot be operated and will not advance into Standby mode.



If any POST test fails, an alarm message will be displayed. Contact FlexRadio Support for assistance. There are no user-serviceable components inside the amplifier.



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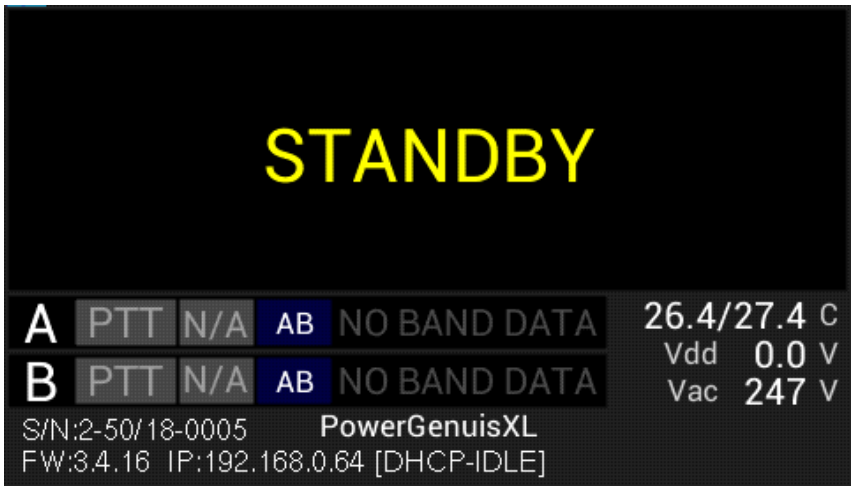
When the power-on-self-test completes the amplifier will enter **STANDBY** mode.



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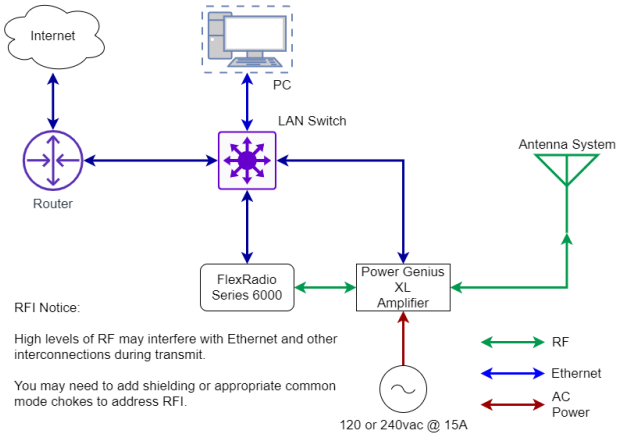
3.2 Configuring for use in FlexRadio environments

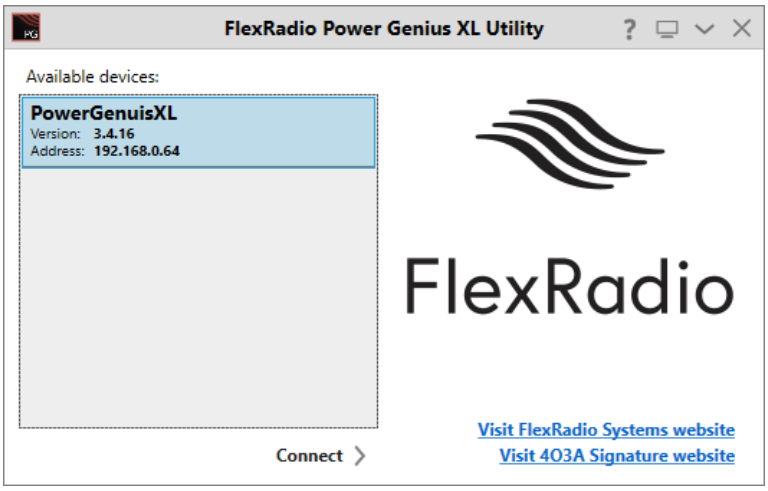
When the Power Genius XL is used in a FlexRadio environment, the amplifier should be connected to the Local Area Network (LAN) with the supplied Ethernet cable and must be configured to work with the transceiver or transceivers that will drive it. The basic configuration of the amplifier is accomplished using the ***Power Genius XL Utility*** program. Please see section ***15.1, Installing the Power Genius XL Utility,*** for installation instructions.

When the amplifier is ready to configure, it should be connected in a fashion similar to the following:



3.2.1 Connecting the Power Genius XL Utility program

Start the ***Power Genius XL Utility*** program. It will automatically discover your Power Genius XL amplifier, and you should see something like this:



If you do not see your Power Genius XL in the Available devices list, please:

- Double-check your network connections and cables.
- Ensure the Power Genius XL is powered on, and an IP address is displayed on the front panel. See section **3.1, Unpacking and Initial** Setup for details.
- Check that the PC's firewall is configured to allow the ***Power Genius XL Utility*** to communicate over your network. Opening a port in the firewall usually is performed during the utility installation process.

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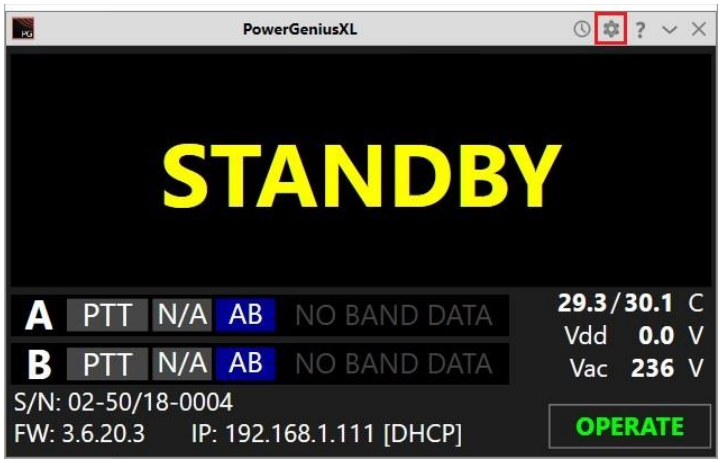
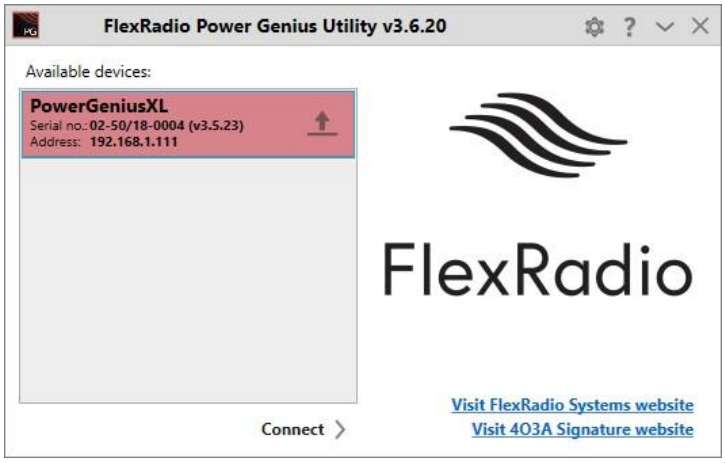
- Check that your PC and Power Genius XL share the same logical network. The IP address of your PC and the Power Genius XL should be similar, though not identical.
- If you still have trouble, please submit a HelpDesk ticket for assistance.

Click on your amplifier to select it, then click on the **Connect** button.

Once connected, an amplifier status screen will appear, like the image below. Click on the configuration settings button (outlined in red) to open the amplifier's **Device settings** screen and then continue to section **3.2.2**, **Network Tab: Set a Custom Device Name** to set up the amplifier's configuration.



If you see a screen similar to the following, please proceed to section **10, Firmware Upgrade Procedure** to upgrade the amplifier's firmware to the version that corresponds to the ***Power Genius XL Utility*** program.



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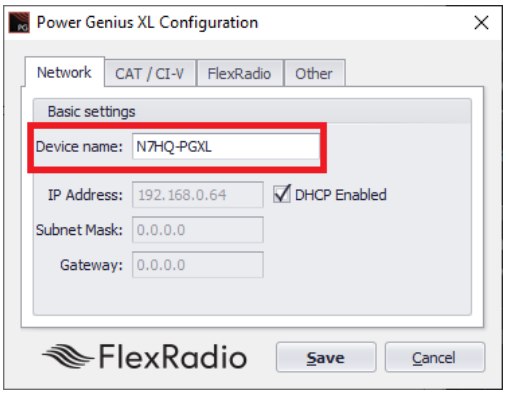
3.2.2 Network Tab: Set a Custom Device Name

You can customize your Power Genius XL by configuring a device name to uniquely identify your amplifier. This name will appear on the amplifier's front panel, in the utility Available devices list, and the utility's main window.



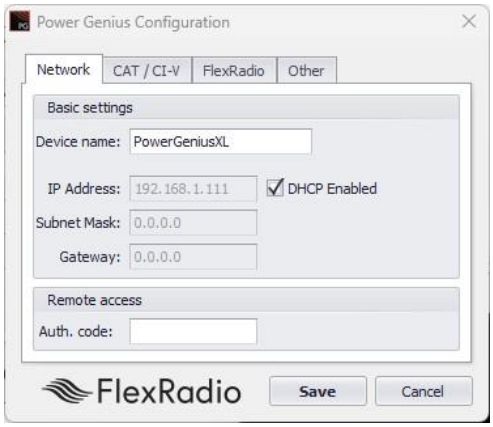
- Select the Network Tab on the Configuration screen.
- Enter an appropriate name in the Device name field.
- Click **Save**

i – The amplifier will reboot when Save is clicked.

i – You do not need to click Save after every configuration change. You can postpone it until you have completed all the configuration steps, but you must click Save at some point to save the configuration for later use.

3.2.3 Network Tab: Configuring the Network

The Power Genius XL is configured at the factory (or after a factory reset) to use DHCP IP addressing and will automatically secure an IP Address appropriate for your network when it starts. This configuration should be sufficient for most situations.



You can use the Network tab to assign a static IP Address, a static Network Mask, and a Gateway address. Static IP addresses are desirable in some network configurations but require specific technical knowledge of the

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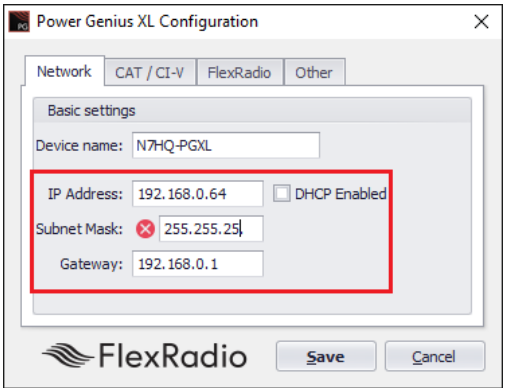
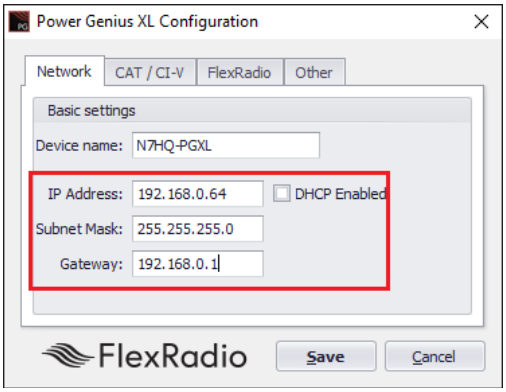
network. Most configurations will not require these steps. If you don't need any of these options, please proceed to the next section.

The network settings screen performs basic validation of the network settings. Note the red X next to an incorrectly formatted subnet mask below.





If you are not familiar with the rules of setting or using static IP addresses but believe you need to configure one, please submit a HelpDesk ticket for assistance.

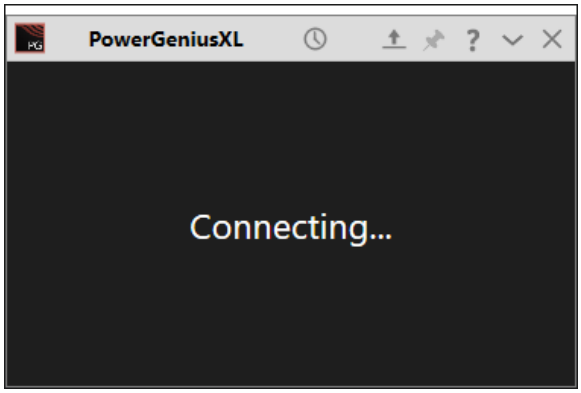
When you have completed the network configuration, click **Save** to instruct the Power Genius XL to save the configuration before performing the next step.

i – The amplifier will reboot when Save is pressed.

i – It is unnecessary to exit and restart the *Power Genius XL Utility* after Save is pressed.

i – If incorrect network information was saved, please follow the instructions in section *11, Factory Reset of the Power Genius* XL.

Once you have pressed save, the configuration dialog will close, and the ***Power Genius XL Utility*** will wait for the amplifier to reboot.



The utility will reconnect to the amplifier when it appears on the network.

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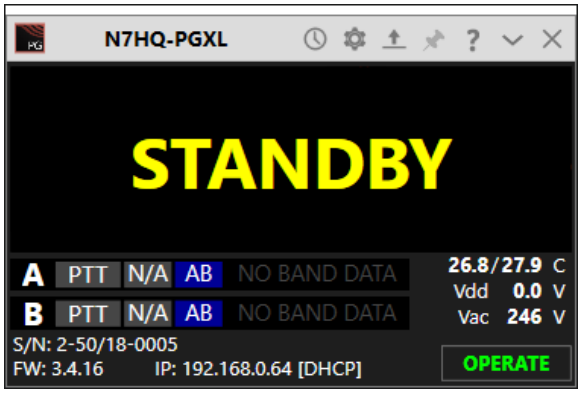
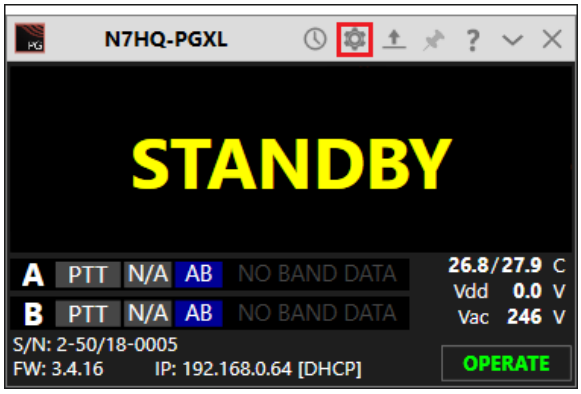


Before moving to the next step, please click the configuration (gear) icon.



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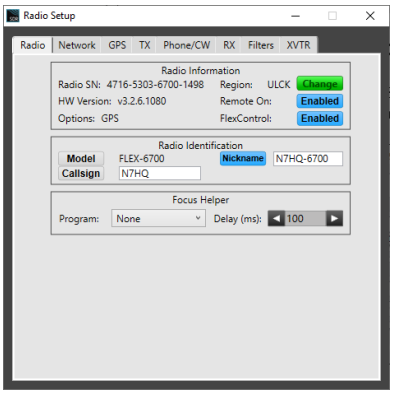
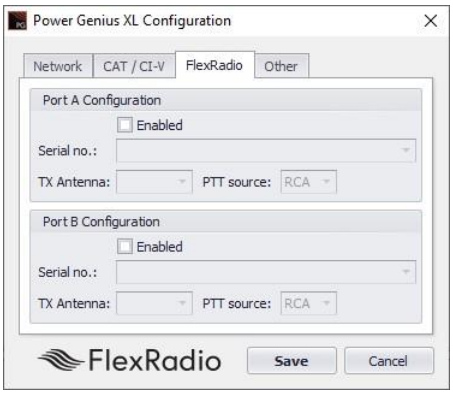
3.2.4 FlexRadio Tab: Configuring for a FLEX-6000 Series Transceiver.

To pair the amplifier for use with a FLEX-6000 Signature Series transceiver, turn the radio on, then click on the **FlexRadio** tab in the **Power Genius XL Configuration** screen:



Location of Radio SN



Select the discovered Radio SN

Enable: Each of the port configuration windows contains an enable switch. When this switch is off (not checked), the amplifier will ignore any Flex radio configured for that port. The configuration fields will be dimmed and no changes to the configuration can be made. Click the **Enabled** check box to activate the configuration information for the amplifier port. The ports can be enabled and disabled without altering the configuration information.

Serial Number: The utility program will detect your FLEX-6000 transceiver(s) automatically. If your radio is connected to Port A of the amplifier, click on the Port A serial number drop-down list, and select your radio. You can find your radio's serial number on a sticker on the back panel of the radio or in the Smart SDR Radio Setup dialog as shown above. If a FLEX-6000 transceiver is connected to Port B, make the Port B configuration settings similarly.

It is ***not*** required that you connect ANT1 output on a FLEX-6000 Signature Series connect to Port A input on the amplifier. Any FLEX-6000 antenna output can be connected to any Power Genius XL Port. However, it ***is*** required that the configuration match the physical connections.

TX Antenna: This field configures the amplifier to follow frequency changes on the port and automatically switches in the correct output filters. For example, if ANT1 on a FLEX-6000 transceiver is connected to amplifier Port A input, select ANT1 as value for the **Port A Configuration** section. When **ANT1** is selected for transmitting on a slice, the amplifier will make the corresponding changes to its output filters. The selected band will appear on the amplifier's front panel and the utility program’s screen.

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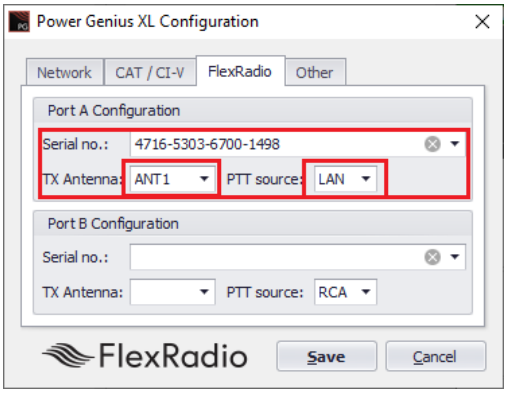
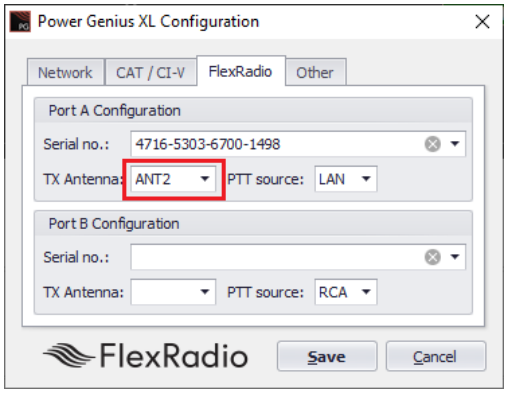


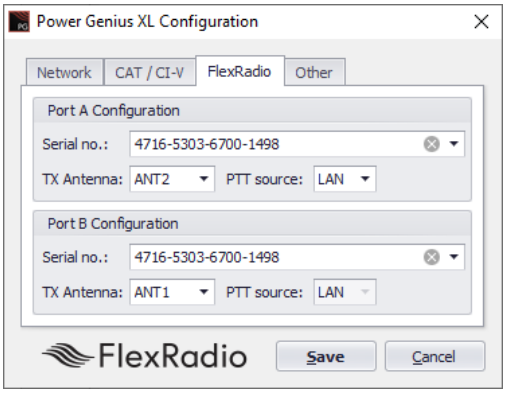
ANT1 is Connected to Port A, LAN PTT



ANT2 is Connected to Port A, LAN PTT

When driven by a FLEX-6000 Signature Series transceiver, the amplifier can be keyed over the **radio's LAN connection**. This option is strongly recommended; however, you can use a PTT signal wire connected to the appropriate **RCA PTT Input** on the amplifier back panel. A twenty millisecond (20ms) TX delay must be set for each Transmit profile that uses the Power Genius XL if you do. Select the desired keying source in the **PTT Source** box on the configuration screen for each radio. **LAN** keying manages all the necessary transmit delays automatically.

When the same FLEX-6000 transceiver is connected to both Power Genius XL ports (A and B), you must select the same serial number for both Port A and B sections. This configuration enables advanced Single Operator Two Radio (SO2R) operations, with a single transceiver and amplifier.



SO2R Configuration ANT2->Port A, ANT1->Port B

Click the **Save** button to record the configuration in the amplifier. The Power Genius XL amplifier is now configured for use by the FLEX-6000 Signature Series transceiver. Please proceed to section **3.6**, **Testing** to complete the setup.

! – Do not connect another transceiver via RS-232 (CAT), CI-V, or BCD to the same amplifier Port configured for a FlexRadio transceiver.

i – Do not connect a PTT line when interfacing with a FLEX-6000 transceiver. Unless some advanced need requires a separate PTT signaling wire, LAN signaling is all you need.

i – The LAN integration of the Power Genius XL amplifier is supported in SmartSDR Version 2.0 and later versions. It is not supported in SmartSDR Version 1.

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3.3 Configuring for use with stand-alone FlexRadio M model transceivers.

When the Power Genius XL is used in a stand-alone FlexRadio environment (a FlexRadio Signature Series 6400M or 6600M with no Local Area Network connection), the amplifier should be connected directly to the transceiver using an Ethernet patch cable and configured using the Front Panel Configuration tool. See section **3.4.2**, **Configure Using the Front Panel** for instructions on the use of this tool. Once configured, the amplifier will follow all frequency and mode changes and transmissions made by the transceiver.

In the stand-alone configuration the following limitations apply:

- The Power Genius XL Utility program cannot be used to monitor the amplifier locally or remotely.
- Only one FlexRadio transceiver can be connected to the amplifier, however other makes of transceivers can be connected following the instructions in section **3.4**, **Configuring for Use with Other Exciters**.
- The amplifier will need a few extra seconds after it starts to find the FlexRadio transceiver and show the connection on the front panel.

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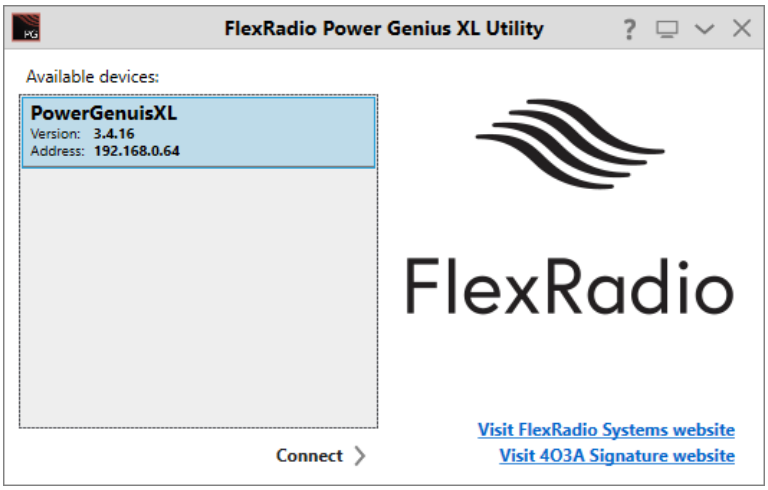
3.4 Configuring for Use with Other Exciters

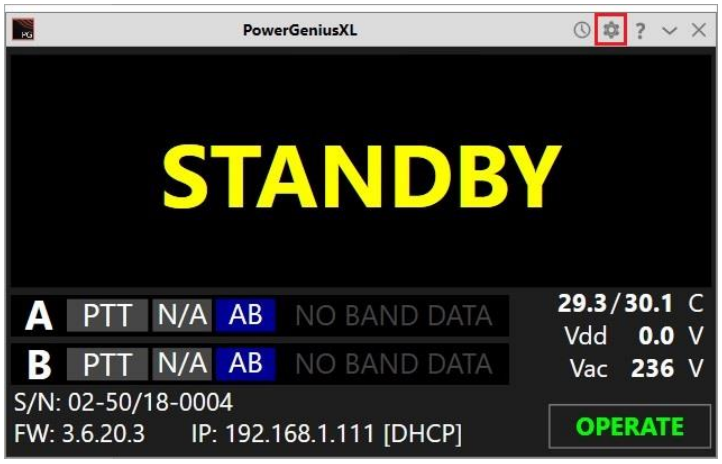
3.4.1 Configure Using the Utility Program

The following describes the configuration of the Power Genius XL for use with non-Flex exciters using CAT data inputs.

Start the Power Genius XL Utility program and connect to the amplifier. Double click on the amplifier in the chooser:



Click the configuration icon, as shown below, outlined in red. Click on Options, then Device Settings in the drop-down menu:



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The following configuration screen will appear. Click on the CAT/CI-V tab:

The Power Genius XL implements seven “dialects” of the CAT communication protocol. These dialects vary from one manufacturer to another so that the amplifier must be told which to expect from the exciter. Seven dialects are supported:

- Kenwood_1 – Older model Kenwood radios
- Kenwood_2 – Newer model Kenwood radios
- Elecraft – Elecraft K3 and K4 radios
- Icom – All models of Icom radios
- Yaesu_1 – Older models of Yaesu radios
- Yaesu_2 – Newer models of Yaesu radios
- Yaesu_3 – Newer models of Yaesu radios

Choose the dialect that seems to be closest to your radio’s make and model. If that choice doesn't work correctly, choose another. Tune the radio to various frequencies and change the mode from sideband to CW and back while watching the displayed frequency and mode on the amplifier’s front panel. If the choice of dialect is correct, the amplifier will track frequency and mode changes in real time.

If a choice of dialect does not work correctly, try another, but avoid making any transmissions until you are certain that the amplifier is tracking frequency and mode changes correctly. If none of the choices work correctly, please submit a HelpDesk ticket for assistance.

Click on the *Enabled* flag for Port A or B (or both) to activate the *Radio type* field(s). Select the appropriate CAT language implementation from the drop-down menu. Select the *Baud Rate* and *Line Control* information:

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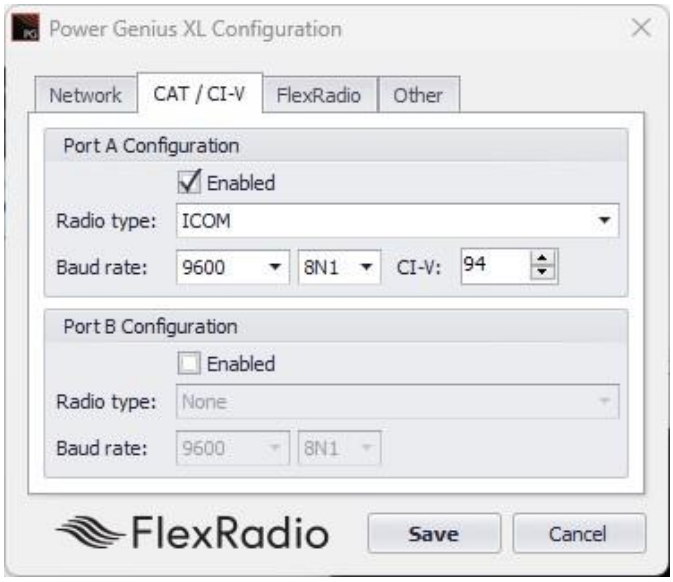
Click on Save to save the configuration and reboot the amplifier.

To configure for operation with an Icom transceiver, select ICOM in the *Radio Type* field then fill in the *Baud Rate, Line Control,* and the transceiver's CI-V address:



Click on Save to save the configuration and reboot the amplifier.

When this step is done, proceed to section **30, Interfacing with Other Exciters** to set up the connections between the amp and the radios.

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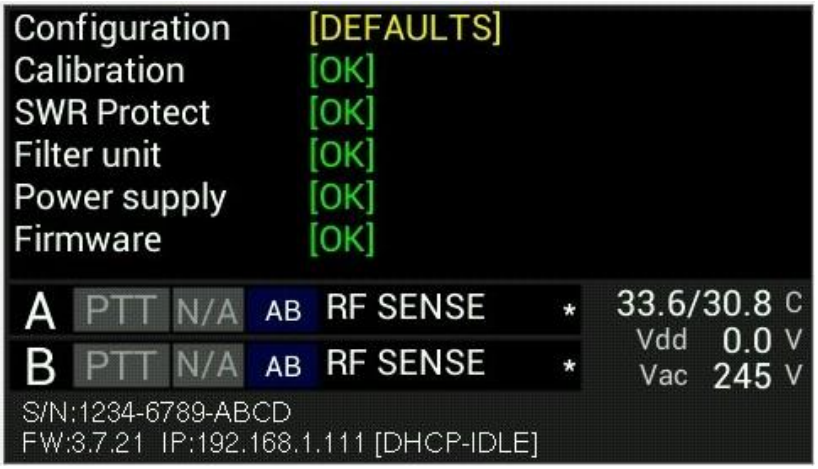
3.4.2 Configure Using the Front Panel

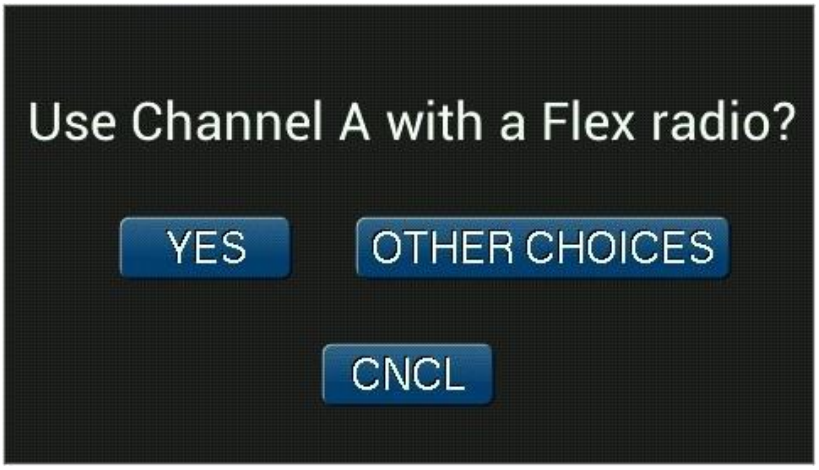
The Power Genius XL can be configured without using the Windows™ Utility program by use of the front panel touch screen. The A and/or B ports can be configured for use by FlexRadio Systems transceivers and other transceivers. This section describes how to use the front panel touch screen configuration tool.

i – A rubber pencil eraser makes a good tool for touching the buttons on the front panel.

If the amplifier has not been configured, for example after a "factory reset", the front panel will show the following screen:



The configuration tool is started by touching the appropriate Band Data box, which in the image above contains the "RF SENSE" text. The following screen will appear:



Touching the YES button will cause the amplifier to search for FlexRadio Systems transceivers in the amplifier's local area network. The following screen will appear:

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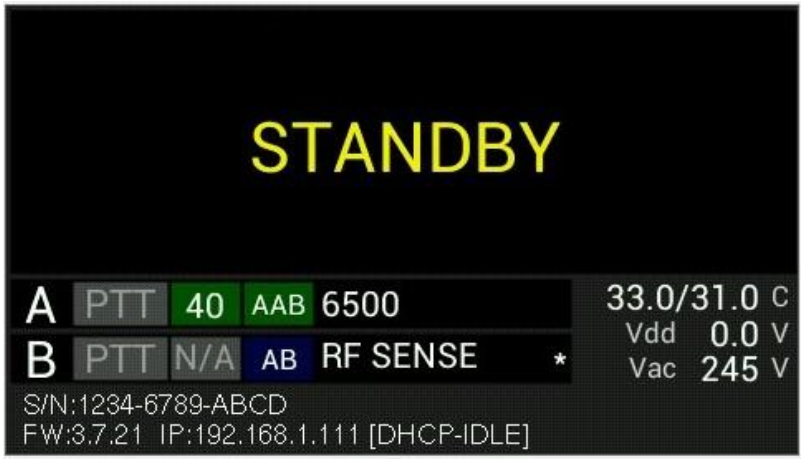
When you see the radio that you want to use, touch NEXT. The following screen will appear:

The amplifier offers pre-selected configuration choices. Touch the NAME, ANT, PTT and ENABLE buttons to cycle through the available values for each configuration parameter. Touch SAVE to save the configuration and reboot the amplifier. After a successful configuration and reboot, a screen similar to the following should appear, showing that the amplifier is ready for use:



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After the amplifier has been configured, the touch panel configuration tool can be used to modify the configuration. Touch the appropriate band data field to produce the following screen:

Touching any of the eight buttons in the first two rows of buttons will change the selected amplifier port to the selected band source. For example, touching BCD changes the port to use the BCD band data back panel input.

- **FLEX** – Use a Flex radio connected via LAN for band data.
- **CAT** – Use an exciter connected to the CAT input.
- **CI-V** – Use an Icom exciter connected to the CI-V input.
- **BCD** – Use an exciter connected to the BCD input.
- **P2B** – Use an exciter connected to the Pin To Band input.
- **SENSE** – Use the amplifier's "rf sense" capability to determine the band.
- **MAN** – Use manual selection of the band.
- **AUTO** – Enable FLEX, CAT, CI-V, BCD, P2B and SENSE and use whichever input provides data.

When the **FLEX** button is selected, the following screen will appear:

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Touch the **NAME**, **ANT**, **PTT** and **ENABLE** buttons to scroll through available options, then touch **SAVE** to apply the configuration. See section **9.6.3, FlexRadio Tab** for information about the options.

When the **CAT** button is selected, the following screen will appear:

Touch the **TYPE**, **RATE**, **LINE** and **ENABLE** buttons to scroll through available options, then touch **SAVE** to apply the configuration. See section **9.6.2, CAT/CI-V Tab** for information about the options.

When the **CI-V** button is selected, the following screen will appear:

Touch the ***** buttons to select the CI-V address, then touch the **RATE**, **LINE** and **ENABLE** buttons to scroll through the available options. Touch the **SAVE** button to apply the configuration. See section **9.6.2, CAT/CI-V Tab** for information about the options.

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When the **MAN** button is selected, the following screen will appear:

Touch the desired band then touch SAVE to apply the configuration.

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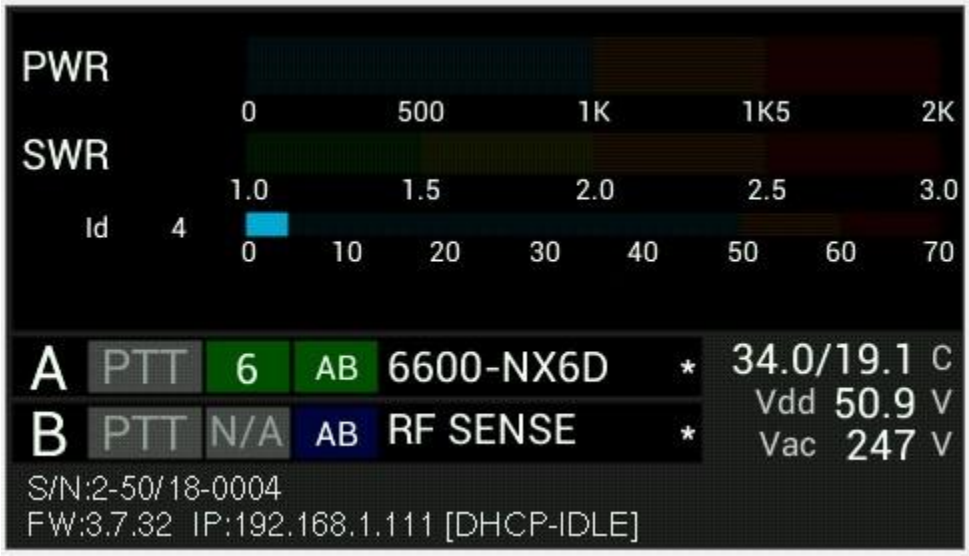
When the **AUTO** button is selected, the amplifier will select band data information from the first input that provides data, in the following order:

- PIN
- BCD
- CAT
- Flex
- RF Sense

Be careful using the AUTO option as the amplifier polls these inputs continuously and will switch from one to another any time an input becomes active or inactive.

When AUTO is in effect, it is indicated by an asterisk (*) in the band data field on the front panel display, as shown below:



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3.4.3 Interfacing with Other Exciters

You can connect more than one radio type to a Power Genius XL, provided each radio is exclusively connected to one of the amplifier ports (A or B). Although each port has multiple interfaces to receive band data and key the amplifier, the amplifier does not support multiple radios on a single amplifier port.

3.4.3.1 Elecraft

The amplifier requires both band data and a PTT line from Elecraft radios. Band data is available via CAT commands or by using a custom wired BCD band decoder cable.

PTT

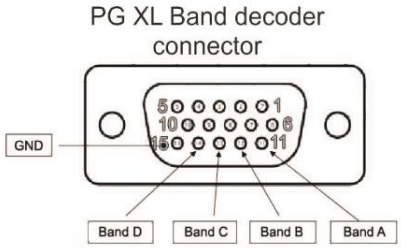
Connect an appropriate cable (RCA male terminated on both ends) between the radio's **Key output** and the **PTT Input** corresponding to the amplifier Port (A or B) used.

Band Data (CAT)

If the Elecraft radio provides an RS-232 serial port connection over which CAT commands are sent, then connect that port on the radio to the **CAT Input A** or **CAT Input B** connector on the amplifier and configure the amplifier for an Elecraft CAT connection. As the radio changes frequency and mode, it will send information about these changes to the amplifier in the form of CAT commands and the amplifier will track the radio's changes.

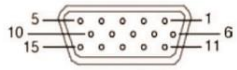
Band Data (BCD)

If a CAT connection is not available, configure and connect a band data cable as shown below. The connection is the same for all Elecraft radio models.



PG XL		Elecraft
PIN 11	to	PIN 13
PIN 12	to	PIN 3
PIN 13	to	PIN 9
PIN 14	to	PIN 14
PIN 15	to	PIN 5/12

K3 Band Data Connector (ACC)



ACC Connector (female, on KIO3 panel, viewed from the back of the K3)

Pin #	Description
1	FSK IN (see **FSK Input**)
2	AUXBUS IN/OUT (see KRC2 or XV-Series transverter instruction manual)
3	BAND1 OUT (see **Band Outputs**)
4	PTT IN (in parallel with MIC PTT)
5	Ground (RF isolated)
6	DIGOUT0 (see **Transverter Control**)
7	K3 ON signal (out) or TX INH (in) (see **Transverter Control, TX INH**)
8	POWER ON (see pg. 44)
9	BAND2 OUT (see **Band Outputs**)
10	KEYOUT-LP (10 mA keying output)
11	DIGOUT1 (see **DIGOUT1**)
12	Ground (RF isolated)
13	BAND0 OUT (see **Band Outputs**)
14	BAND3 OUT (see **Band Outputs**)
15	EXT ALC input (see **External ALC**, pg. 27)

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You can connect either the **BCD/PTB Input A** or **BCD/PTB Input B** connector on your amplifier to the ACC connector on the Elecraft transceiver using a female-to-female DE-15 cable (DE-15 male connectors on both ends of the cable), customized as detailed above.

Configuration

Follow the instructions in section **3.4.1**, **Configure Using the Utility Program** or section **3.4.2**, **Configure Using the Front Panel** to configure the amplifier to receive band and mode data from the Elecraft radio., then proceed to section **3.5, Required RF Output Delay (TX Delay)** to complete the setup

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3.4.3.2 Kenwood

The amplifier requires both band data and a PTT line from Kenwood radios. Band data is available using the CAT protocol via RS-232.

PTT

Connect an appropriate cable between the radio's PTT output and the **PTT Input** corresponding to the amplifier Port (A or B) used. Some models may require a custom cable to access radio PTT from an accessory connector.

Band Data (CAT)

RS-232 (CAT) connections use a straight-through female-to-female DB9 cable.

Connect either the **CAT Input A** or **CAT Input B** connector on your Power Genius XL to the CAT connector on the Kenwood transceiver using a female-to-female DB9 cable.

Configuration

Follow the instructions in section **3.4.1**, **Configure Using the Utility Program** or section **3.4.2**, **Configure Using the Front Panel** to configure the amplifier to receive band and mode data from the Kenwood radio., then proceed to section **3.5, Required RF Output Delay (TX Delay)** to complete the setup

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3.4.3.3 Icom

The amplifier requires both band data and a PTT line from Icom radios. Band data is available using RS-232 (CAT) or CI-V.

PTT

Connect an appropriate cable between the radio's PTT output and the **PTT Input** corresponding to the amplifier Port (A or B) used. Some models may require a custom cable to access radio PTT from an accessory connector.

Band Data (CAT)

RS-232 (CAT) connections use a straight-through female-to-female DB9 cable.

Connect either the **CAT Input A** or **CAT Input B** connector on your Power Genius XL to the CAT connector on the Icom transceiver using a female-to-female DB9 cable.

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Band Data (CI-V)

You can connect either the **CI-V Input A** or **CI-V Input B** connector on your amplifier to the CI-V connector on the Icom transceiver using a standard 3.5mm three-wire (TRS) or a two-wire (TR) cable.

Configuration

Follow the instructions in section **3.4.1**, **Configure Using the Utility Program** or section **3.4.2**, **Configure Using the Front Panel** to configure the amplifier to receive band and mode data from the Icom radio., then proceed to section **3.5, Required RF Output Delay (TX Delay)** to complete the setup.

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3.4.3.4 Yaesu

The amplifier requires both band data and a PTT line from Yaesu radios. Band data is available using either the CAT protocol via RS-232 or BCD band data from a DIN connector.

PTT

Connect an appropriate cable between the radio's PTT output and the **PTT Input** corresponding to the amplifier Port (A or B) used. Some models may require a custom cable to access radio PTT from an accessory connector.

Band Data (CAT)

RS-232 (CAT) connections use a straight-through female-to-female DB9 cable.

You can connect either the **CAT Input A** or **CAT Input B** connector on your amplifier to the CAT connector on the Yaesu transceiver using a female-to-female DB9 cable.

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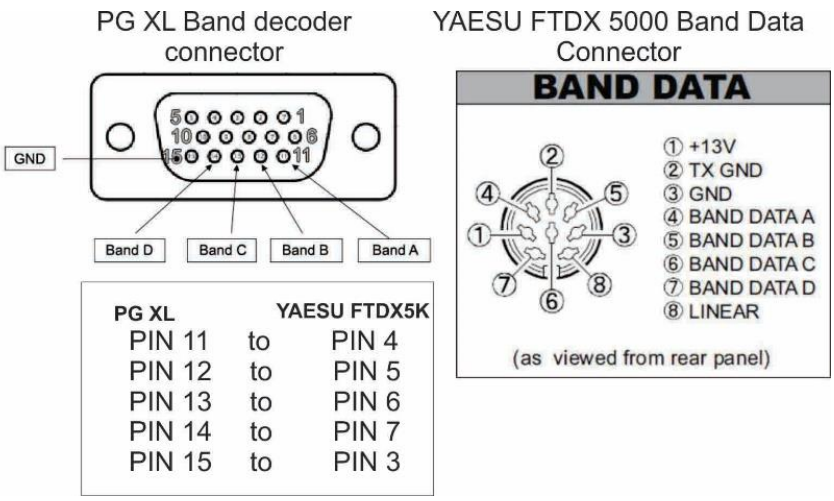
Band Data (BCD)

Alternatively, you can use a BCD connection between the eight-pin DIN (Band Data) connector on the Yaesu transceiver to the Band Data A or Band Data B (DB15) connector on the amplifier



BCD connections use a custom cable configured as shown in this diagram.

i – Optocouplers protect all serial and digital inputs or outputs on the Power Genius XL

Configuration

Follow the instructions in section **3.4.1**, **Configure Using the Utility Program** or section **3.4.2**, **Configure Using the Front Panel** to configure the amplifier to receive band and mode data from the Icom radio., then proceed to section **3.5, Required RF Output Delay (TX Delay)** to complete the setup.

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3.4.3.5 Unlisted Exciters

PTT

Connect an appropriate cable between the radio's PTT output and the amplifier's **PTT Input** A or B jack. Most radios have a PTT interface. However, it is essential to check your exciter' operating manual to determine the keying voltage and current, especially with older radios. The Power Genius XL PTT lines are opto-isolated, but they will not tolerate high voltages or an AC voltage. Be prepared to provide a keying buffer relay designed for the task, like the Ameritron ARB-704 amp to transceiver interface.

i – Some operators choose to use a keying buffer in all cases as "insurance" to prevent any possible damage to the exciter or amplifier due to possible transient voltage spikes or RF ingress.

Band Data

Most radios use one of these protocols to send band data to external devices:

- **BCD / PTB protocol**

  Connect your radio or band decoder to the **BCD/PTB Input A** or **BCD/PTB Input B** connector on the amplifier. This connection requires no additional configuration and works automatically. Band data arriving on the BCD/PTB connection overrides other sources. See section **2.3**, **PTB/BCD Connector Pinout,** for additional information.

- **CAT protocol**

  Connect your radio's CAT output to the **CAT Input A** or **CAT Input B** connector on the amplifier. Configure the CAT protocol details using the ***Power Genius XL Utility***.

- **CI-V protocol**

  Connect your radio's CI-V output to the **CI-V Input A** or **CI-V Input B** connector using a 3.5mm TS or TRS connector. Configure the CI-V protocol details using the ***Power Genius XL Utility***.

- **Frequency Measurement**

  The Power Genius XL will measure an RF signal's frequency applied to one of its inputs and automatically switch in the appropriate filters. This band switching mode often requires that you double-key briefly before the transmission to allow the filter switching to complete.

Please proceed to section **3.5, Required RF Output Delay (TX Delay)** to complete the setup.

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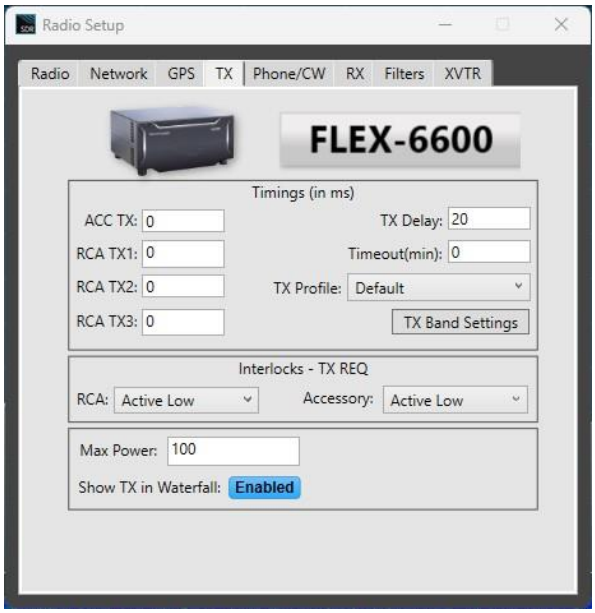
3.5 Required RF Output Delay (TX Delay)

The Power Genius XL firmware manages all amplifier state transitions. However, the Operate to Transmit transition requires that the exciter slightly delay emitting RF until the transition is complete. In general, the Power Genius XL requires a minimum delay of 20 milliseconds (20ms) between the time the keying signal arrives at the amplifier and the arrival of the exciter RF signal. This time delay is necessary for the amplifier to complete all preparations to accept and amplify a signal safely. The following sections provide detailed information about setting the delay.

3.5.1.1 FlexRadio FLEX-6000 Signature Series

When keying the amplifier with FlexRadio 6000 Series transceivers using **LAN** keying, the "TX Delay" value should be set to 20 milliseconds.



3.5.1.2 TX Delay for Other Exciters

When keying the amplifier with other than FlexRadio 6000 Series transceivers (or keying the amplifier via the **PTT Input** jack connected to a Flex radio), you will need to use a radio configuration or setting to delay RF generation by at least twenty milliseconds (20ms) after the keying signal (PTT) is sent to the amplifier by the exciter.

Please consult the manual for your transceiver or exciter to enable and configure the transmit delay.

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3.5.1.3 Exciters Without a TX Delay Adjustment

If the exciter does not support a transmit delay, then configure the amplifier and exciter in the following way:

- Connect the keying device (mic PTT switch, foot pedal, etc.) to the appropriate Power Genius XL **PTT Input.** The appropriate input is the same amplifier port (A or B) where the exciter output is connected.
- Connect the amplifier's **PTT Output** (port A or B) to the exciter in place of the keying device.

When the amplifier is keyed, the Power Genius XL will manage the output keying signal delay and assert PTT at the transceiver when the amplifier is ready to accept RF.

Example: Footswitch PTT wiring for a transceiver connected to Port A that does not have a TX Delay adjustment.

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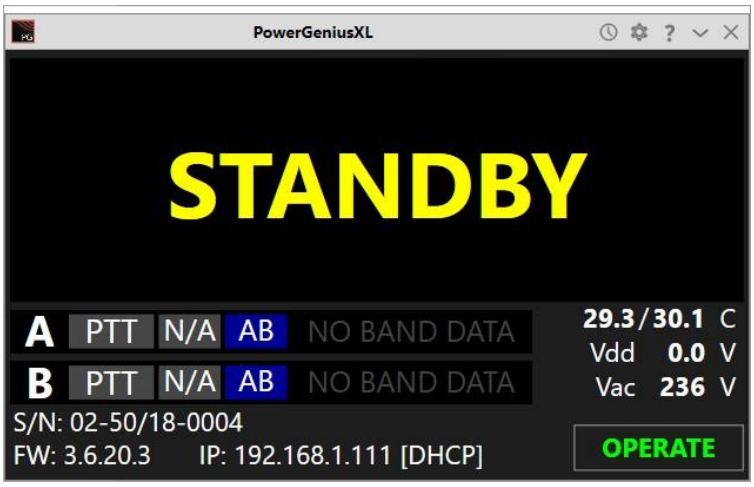
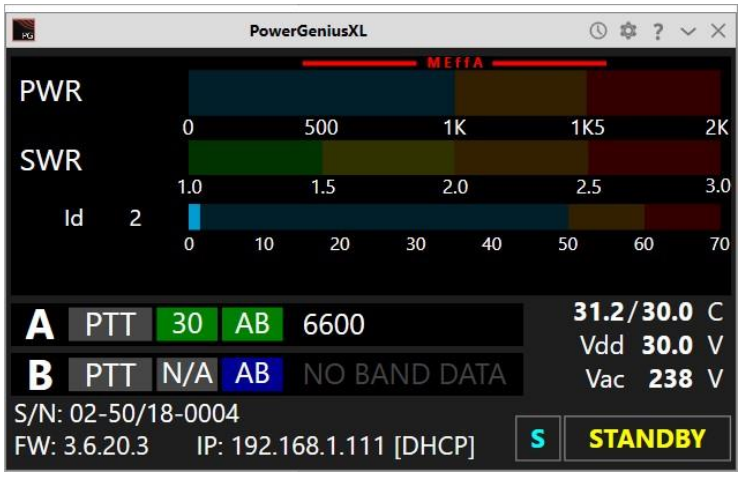
3.6 Testing the Configuration

After following the instructions in the preceding sections, you should test the radio to amplifier connection. Turn the radio and amplifier on and select a band on the radio. The band information should appear on the amplifier's front panel and the ***Power Genius XL Utility*** for the port you have chosen.



Make sure all RF connections are correctly attached and tightened and that an appropriate antenna or dummy load is attached to the appropriate amplifier output.

Put the amplifier in **OPERATE** mode by pressing the **STBY/OPER** button on the amplifier's front panel or the Operate button on the ***Power Genius XL Utility***. The Power/SWR/Id/temperature and voltage meters should now appear.



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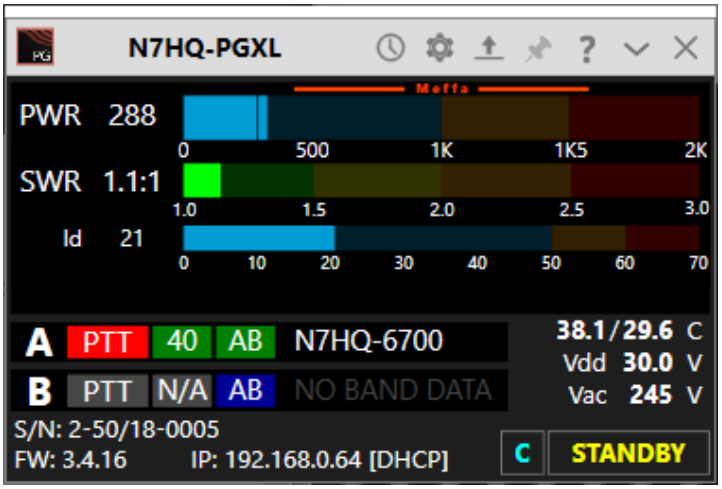
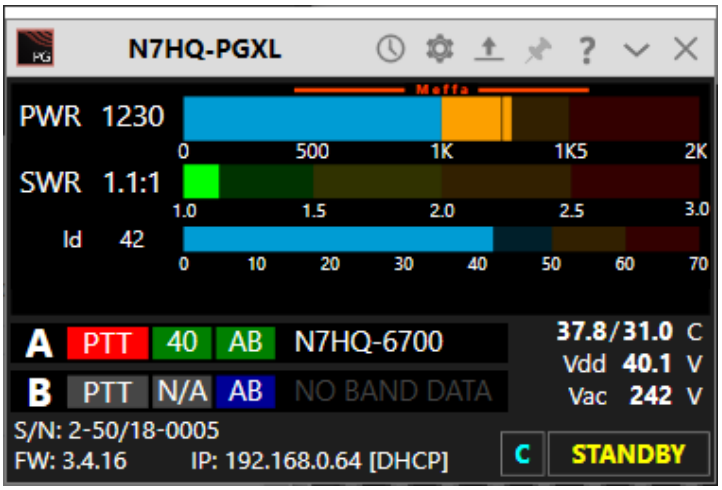
Change to another band and verify the amplifier follows the change.

Set the drive power at the transmitter to about 10 watts and transmit a carrier. The amplifier should switch into transmit mode.



- The front panel LED background status lights will change from green to red
- The PTT indicator on the front panel display will be red.
- The output power level should be about 15dB greater than the input power (about 300 watts for 10 watts of drive).
- The I_d will increase to about 20A.
- SWR will be displayed along with the LDMOS drive voltage and drain current.
- The heatsink temperatures and cooling fan speeds will increase. Provided the SWR remains in the meter's green range, increasing the drive power should produce corresponding increases in I_d and output power.



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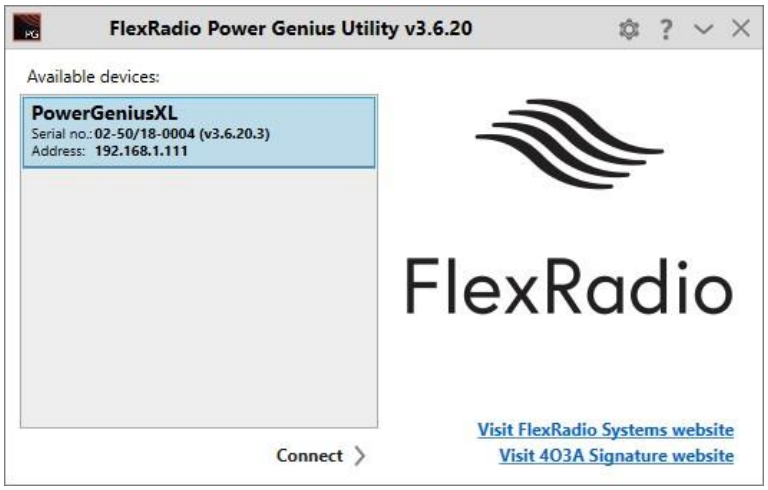
4 Operating the Power Genius XL

4.1 Selecting the Exciter

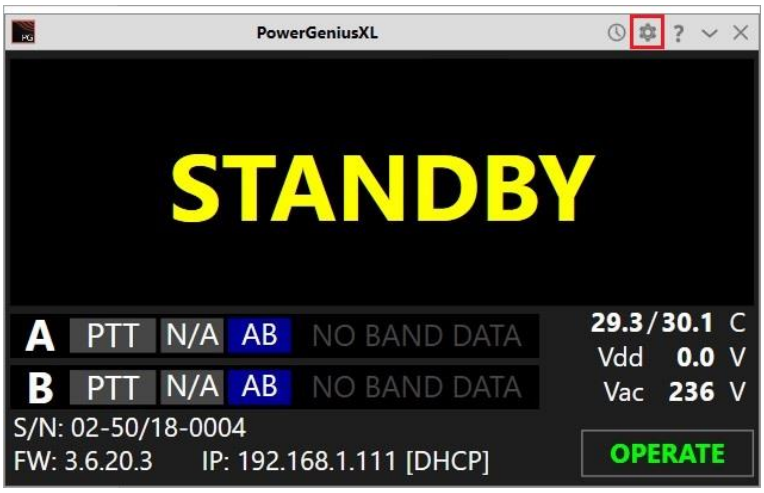
The Power Genius XL amplifier must be configured to work with the transceiver or transceivers ("exciters") that will drive it. The basic configuration of the amplifier is accomplished using the ***Power Genius XL Utility*** program or the front panel touch screen configuration tool described above.

The amplifier can be driven by one or two radios. When using two radios, the makes and models do not need to be the same; each amplifier port allows a separate configuration. Follow the instructions that apply to your circumstance, then proceed to section **3.6**, **Testing** to complete the setup.

Start the ***Power Genius XL Utility*** program. It will find your Power Genius XL amplifier automatically. Click on your amplifier to select it, then click on the **Connect** button.



The amplifier status screen will appear, as shown below. Click on the configuration settings button (outlined in red) to open the amplifier's configuration settings dialog window.



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4.2 Changing Standby and Operate Modes

There are two ways the amplifier can be toggled between Standby and Operate modes.

1. By pressing the STBY/OPER button on the front panel of the amplifier.
2. By changing the mode using software.

Front panel "Hard" button

Smart SDR Button

Power Genius XL Utility Button

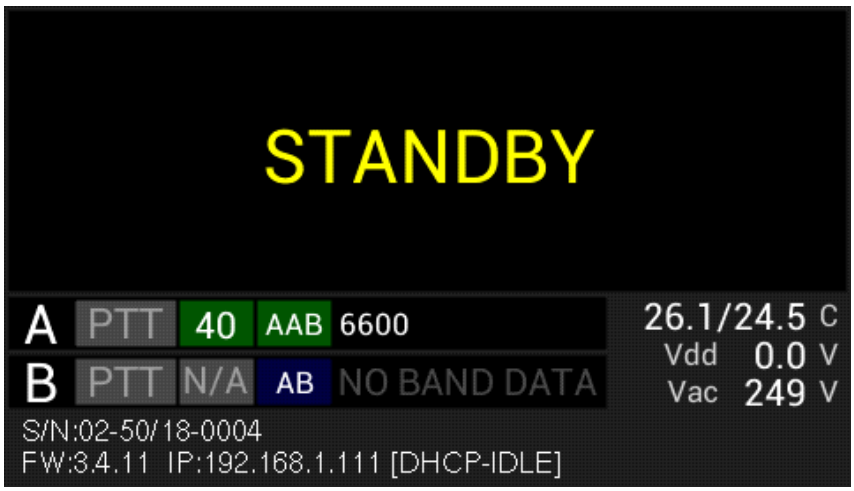
i – When properly configured, a convenient method for switching between Standby and Operate mode uses software connected to the Power Genius XL over the LAN.

The front panel **STBY/OPER** button toggles the operational state between **STANDBY** and **OPERATE** mode.

4.2.1 Standby Mode

In **STANDBY** mode, the amplifier power supply is disabled, and the drive signal is passed, unamplified, to the output ports. The front panel backlights are yellow. The amplifier can remain in this mode indefinitely.

i – The Power Supply Unit (PSU) will generate some heat in Standby, and in relatively warm installation environments, the fans that cool the PSU may engage periodically.



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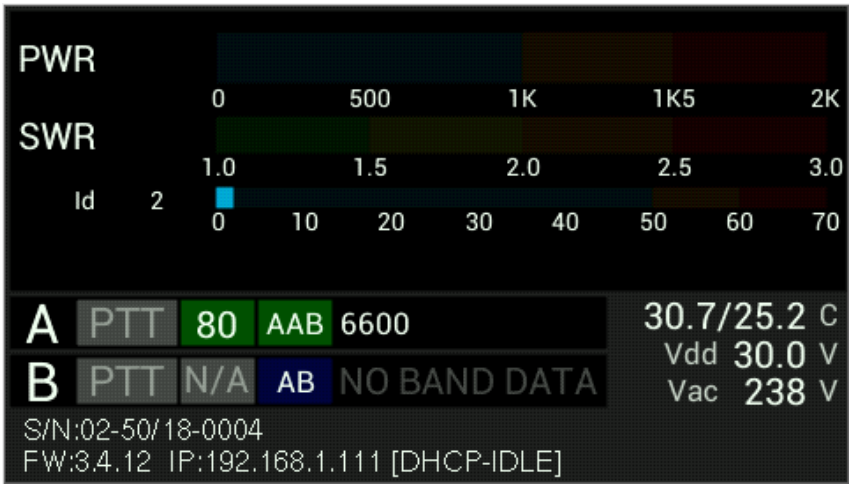
4.2.2 Operate Mode

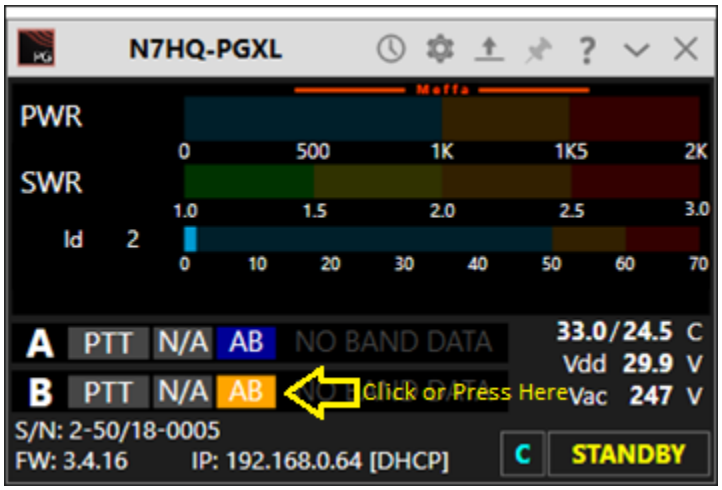
In **OPERATE** mode, the amplifier power supply is engaged, and the amplifier is prepared to receive RF Input Drive and a PTT signal. The front panel meters are active, the LED backlights turn green, band/frequency data is processed, and the correct filters are selected and displayed.



i – Before entering the OPERATE mode, the Power Genius XL will perform a quick self-test of all the modules.

4.3 Setting Amplifier Bias Class

The Power Genius XL has two preset amplifier bias classes, Class AB and Class AAB. You can manually select between the two classes using the touch-screen front-panel on the amplifier or the ***Power Genius Utility*** program. Click or touch the class button on the appropriate port. The button will cycle between (Auto, AB, and AAB).



FlexRadio FLEX-6000 Signature Series transceivers conveniently switch the amplifier's bias class automatically depending on the selected modulation mode in Smart SDR. Manual bias switching is not available when a FLEX-6000 Signature Series is paired and connected.

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4.3.1 Amplifier Bias Class Modes

AB – As its name suggests, this class is a combination of class A and class B operation. This mode sets a small bias voltage and is a good efficiency and linearity compromise between class A and B operation. Use the AB bias class for modes where linearity is not an absolute requirement. MEffA is available only in this class.

AAB – the amplifier operates in *nearly* pure class A territory, offering improved linearity at the expense of efficiency. MEffA is not available in this class.

Auto –the amplifier bias class is automatically selected from the transceiver's data.

Modulation Mode	**Amplifier Class**
AM, USB, LSB, PSK	AAB
CW, FM, FSK, MFSK, Digital (see note)	AB

i – The amplifier monitors the signal and determines the nature of the RF envelope. If it determines the bias class should change, the class label will blink while the amplifier is transmitting and will change to the new bias class when the transmission ends.

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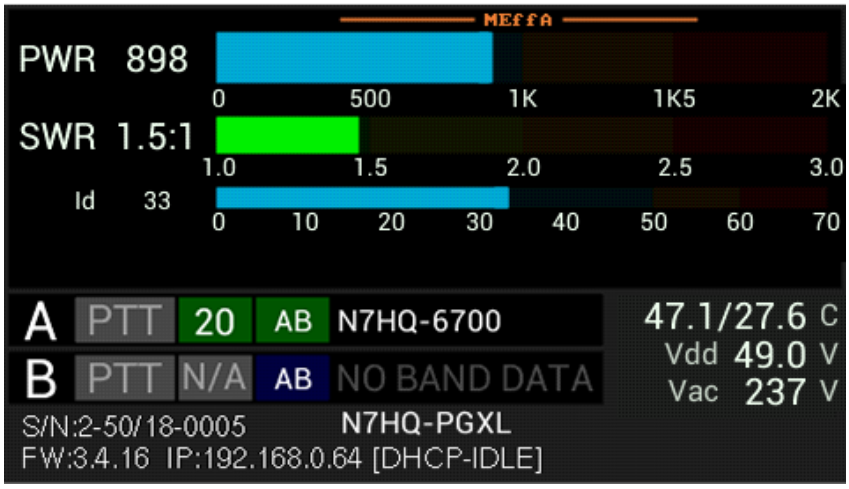
4.4 Transmitting

When the amplifier is transmitting, the front panel display looks like this:



The elements of this display are described in the following sections.

4.4.1 Power Meter (PWR)

The power meter indicates the transmitted peak and average power. It ranges from 0 to over 2000W. When operating above 1500 watts, the meter is shown in red. When the MEffA indicator is displayed in red lettering, the MEffA algorithm is optimizing the amplifier's operating point.

i – Power measurements update approximately every 100ms and should be used for reference only. For a more accurate power reading, transmit a fixed amplitude and frequency signal for at least 1 second.

i – The MEffA indicator on the *Power Genius XL Utility* is "clickable" and allows the operator to switch MEffA mode ON or OFF.

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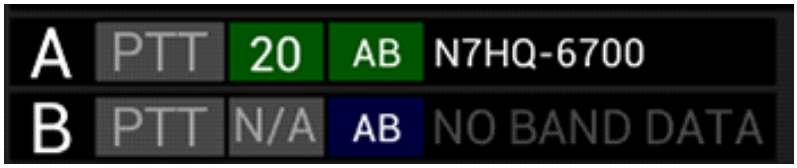
4.4.2 SWR meter

The SWR meter shows the Standing Wave Ratio (SWR) on the transmitting port. The maximum working SWR allowed by the amplifier is 3:1. Output power will be reduced when the SWR exceeds 2:1. Above 3:1, the amplifier will raise the HIGH SWR alarm and stop transmitting.

4.4.3 Id Meter

The I_d meter shows the LDMOS drain current in Amperes. It ranges from 0A to 70A.

4.4.4 PTT and Band Data



These displays show the PTT information, band data, amplifier operating class, and the band data source for Ports A and B. The PTT label is red when PTT input is detected, and the amplifier is transmitting. The next field shows the selected band. When no band is selected, this field will display **N/A** (not available).

The next field indicates LDMOS bias class. Class AB operation is optimal for constant envelope modes, while class AAB is best for SSB and AM. While transmitting, the amplifier monitors the signal and determines the nature of the envelope. If it decides the bias class should change, the class field will blink while the amplifier is transmitting, and the class will change when the transmission ends.

Fields to the right indicate the band data source, which will be one of:

- A FLEX-6000 Signature Series transceiver, in which case it will display your radio's name
- BCD band data
- PTB band data
- CAT band data
- CI-V band data
- Manual band selection

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- RF Sensed band selection
- Automatic band data selection

In Automatic band data selection, the amplifier responds to the first of the band data inputs that provides data. This can cause unexpected results, so the amplifier's default operation is to select one of the band data inputs and ignore the rest. The user selects the band data input by use of the ***Power Genius Utility*** program or the front panel touch screen.

Using the ***Power Genius Utility*** program, right-click on the band data source field on the display. A drop-down menu will appear allowing the user to select the desired band data source. To make this choice permanent, open the Device Settings screen and click Save.

Using the front panel touch screen, touch the band data source field. A configuration screen will appear. Select the desired band data source, set/change the configuration settings, if needed, then touch Save, as shown below:

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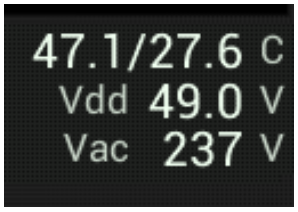
4.4.5 Temperature and Voltage



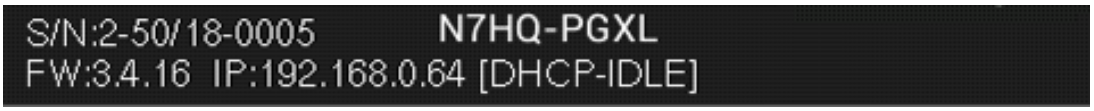
The bottom right part of the display shows:

t	the temperatures (Celsius) of the PA heatsink and Harmonic Load heatsink
V_{dd}	the LDMOS drain voltage
V_{ac}	the AC supply voltage

The optimal operation is below 75° C. Above 80° C, the amplifier will decrease output power to protect it from damage. If the temperature exceeds 90° C, the amplifier will fault and stop transmitting until the temperature drops. Cooling fan speeds are controlled automatically by the firmware using the selected fan profile.

Typical V_{dd} values range from 30V to 53VDC. V_{dd} is determined automatically by the output transistor temperature, the operational mode (AAB or AB) and MEffA.

4.4.6 Additional Information



This section shows the amplifier serial number, device name, firmware version, the IP address, and IP Addressing mode.

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4.5 Status LED (Backlight)

The front-panel LED backlight shows the current operational state:

Backlight Color	Operational Mode
Yellow	Standby
Green	Operate
Red	Transmit
Purple	Firmware Upgrade in Progress

4.5.1 Standby Mode – Yellow backlight

The yellow backlight indicates the amplifier is in **STANDBY** mode. To change to **OPERATE** mode, press the **STBY/OPER** button on the front panel.

4.5.2 Operate Mode – Green backlight

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The green backlight indicates the amplifier is in **OPERATE** mode. To change to **STANDBY** mode, press the **STBY/OPER** button on the front panel.

4.5.3 Transmitting – Red backlight

The red backlight indicates the amplifier is transmitting.

4.5.4 Firmware Upgrade in Progress– Purple backlight

The purple backlight indicates the amplifier is in firmware update mode. The display will show the bootloader version and the IP address of the device. Once the update is complete, the amplifier will restart.

i – When the amplifier is first turned on, these status LEDs gradually brighten, meant to simulate a tube filament warming up.

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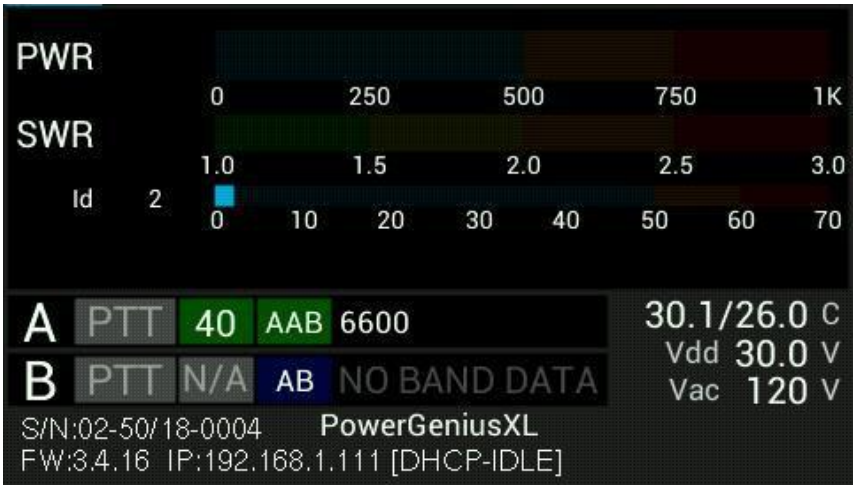
4.6 120 VAC Operations

The Power Genius XL uses a commercial-grade AC/DC power converter to supply power to the amplifier. The Power Supply Unit (PSU) is rated at its full output power when it is supplied with more than 200 volts AC (50 or 60 Hz). The amplifier can be supplied with less than 200 VAC, but it will operate at a reduced power level. It can be operated on 120 VAC, a standard wall-socket voltage in the US.

When operated on 120V AC, the amplifier automatically de-rates its performance in the following ways:

1. Reduces the maximum output power to 700 watts
2. Reduces the APC fold-back threshold to 650 watts.
3. Reduces gain to about 12 dB.
4. Rescales the front panel and the utility program's Power meters to 1000 watts maximum.



i – When the amplifier is operated between 650 and 700 watts, the APC system will reduce power to about 650 watts.

i – When a transmission is attempted above 700 watts, the amplifier will fault, turn off the power supply to protect it from overload and display the "PLEASE UNKEY" message. To clear the overload, you must unkey (stop transmitting).

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5 Maximum Efficiency Algorithm (MEffA™)

The Maximum Efficiency Algorithm (MEffA) controls the amplifier's operational parameters to maximize the linearity of the amplified signal, minimize Intermodulation Distortion products, and maximize power supply efficiency. The amplifier adjusts drive voltage and bias settings based on the type of input signal.

MEffA does not work with signals with varying amplitudes, such as SSB or AM. These modulation modes require more linear operation (class AAB). When MEffA is configured, but the amplifier is operating in class AAB, the MEffA caption on the front panel will be shown in yellow.

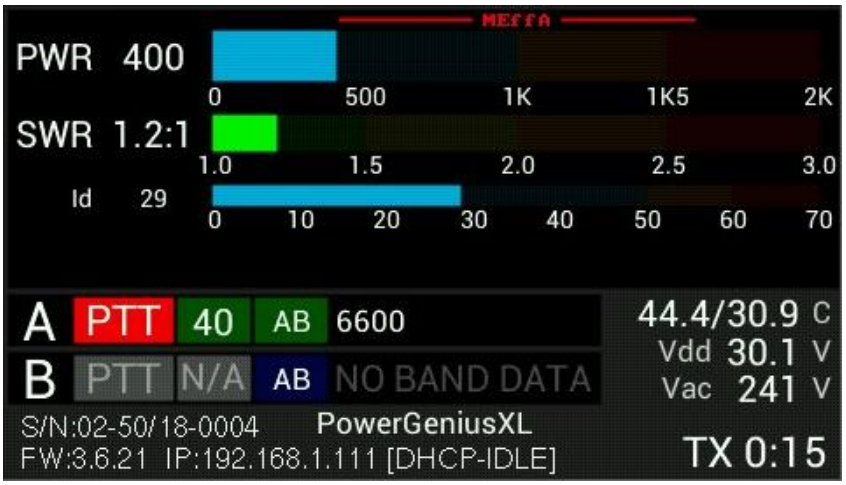
You can operate in class AB without MEffA, which still improves amplifier efficiency for constant level signals relative to maximum linearity amplification.

To adjust MEffA for operation at the desired power level:

- Key the amplifier with a "Tune" or drive signal to establish the desired output.
- Unkey the amplifier and re-key. You may note that the amplifier has modified the LDMOS Drain Voltage and the output power.
- Adjust the drive to re-establish the desired output level.
- Repeat this process until the desired output power is consistently achieved.

You are now ready to operate.

If you don't want to go through this process, you can leave the MEffA box unchecked in the ***Power Genius XL Utility*** program tab "Other" and use a fixed drive level that will correspond to fixed power output on a given band.



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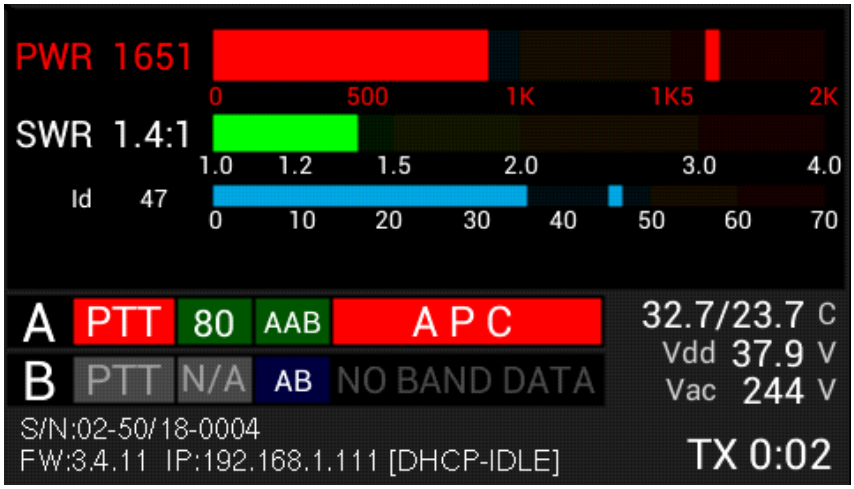
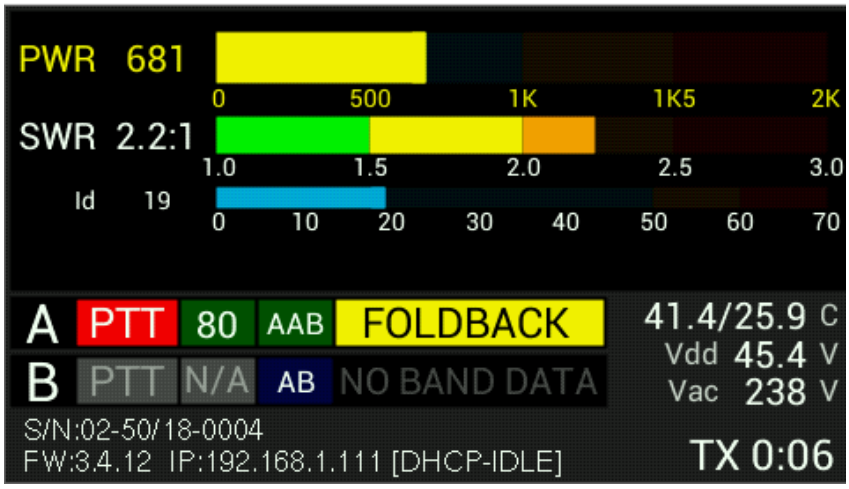
6 Automatic Power Control (APC)

Automatic Power Control (APC) is a system that reduces output power when an operating limit is exceeded, preventing damage to the amplifier. Reacting quickly, it monitors output power, VSWR, and driver temperature. When peak output power exceeds a preset limit, APC will reduce the output power, and the APC alarm will be shown on the amplifier's front panel. APC will limit output power to 2000 watts on all bands except 160 and 20, where it triggers at 1650 and 1750 watts, respectively.





i – The control operator has the sole responsibility for limiting the amplifier's output power to a value at or below his or her licensed limit. APC is not responsible for and does not enforce this limit.

i – When a VSWR of more than 2:1 is detected, APC reduces output power to a safe level, allowing for continued operation. If VSWR exceeds 3.1:1, APC switches the amplifier to STANDBY mode and displays the HIGH SWR alarm.

i – When APC detects that the PA heat sink temperature is nearing its upper limit, it reduces the output power if the MEffA system cannot contain the temperature. When the amplifier cools, APC will restore full power.

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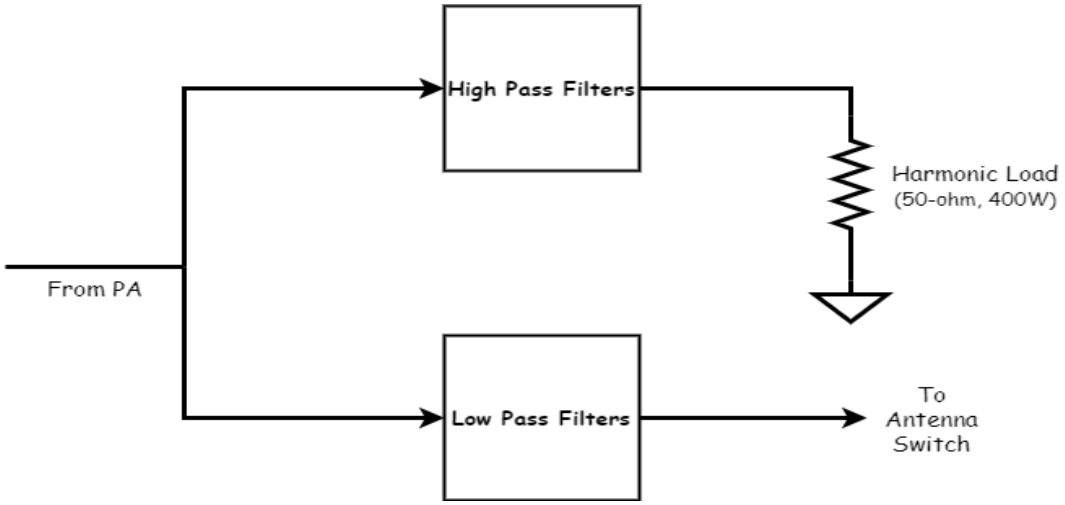
7 Harmonic Load

Solid-state Amateur Band RF power amplifiers typically use low pass filters to suppress harmonic frequency output created during amplification to meet jurisdictional regulations limiting emissions that can cause interference in other frequency bands. With traditional amplifier designs, this harmonic energy is reflected from the low pass filters back into the output stage where it can cause damaging voltage spikes and additional non-linearities.

In addition to a set of low pass filters, the Power Genius XL employs separate high pass filters that route generated harmonics to an internal 400-watt dummy load, called the Harmonic Load. Commonly found only in broadcast-grade transmitters, unwanted harmonic energy is not reflected into the output stage and is safely dissipated as heat. This design improves linearity and allows the amplifier to achieve the same fundamental power output with less LDMOS device peak drain voltage.

The Harmonic Load in the Power Genius XL is mounted on a dedicated heat sink, with independent thermal management, using a discrete temperature sensor and fan controller.



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8 Thermal Management (Cooling)

There are three independently managed fan assemblies in the Power Genius XL; microprocessor-controlled fans manage each based on discrete temperature sensors in the area that they cool.

The ***Power Genius XL Utility*** program provides a configuration option to select one of three active fan profiles: "Normal," "Contest," and "Broadcast." See section **9.6.4**, **Other Tab** for more details.

"Normal" is the least aggressive (most quiet) profile. The fans run more slowly or are off when the amplifier is cool and ramp using a non-linear hysteresis curve as the cooling domains in the amplifier increase in temperature. Power may be turned off after a period of inactivity to allow the fans to turn off. In this case, a slight delay on the next transmission will be imposed by the amplifier to allow time to restart the power supply.

The "Contest" profile uses a more aggressive hysteresis curve and anticipates continuous heavy use, such as might be encountered in a contest situation. Power is not turned off, so fans may run continuously at low speed when the amplifier is idle.

The "Broadcast" profile sets all fans to maximum speed while the amplifier is in **OPERATE** mode.

Independent of the selected fan profile, the unit will always manage the fans to the speed necessary to protect the amplifier. Some combinations of frequency and power levels will cause the fans to run at higher speeds because these configurations are known to generate more heat.

8.1 Power Supply Unit (PSU) Fans

The Power Supply Unit (PSU) is a self-contained unit that manages all thermal aspects, including its fan speed. There is no end-user control available to adjust the thermal management of the PSU.

i – When the amplifier is in STANDBY or OPERATE mode and is not transmitting, the current draw is low, but the temperature may gradually rise in the PSU. The PSU may occasionally cycle its fans to keep the temperature within a safe range.

8.2 Power Amplifier (PA) Fans

Three fans cool the Power Amplifier compartment and heat sink. The PA fans will go to maximum speed when the PA temperature is sensed above 75°C, regardless of fan profile. At or above 85°C, the amplifier will issue a fault and shut down to protect itself.

i – MEffA mode reduces current requirements and will reduce the need for high cooling fan speeds.

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8.3 Harmonic Load and Filter Compartment Fan

The Harmonic Load and Filter Compartment fan will go to the maximum speed at Harmonic Load heat sink temperature of 65°C or higher, regardless of fan profile selection. The Harmonic Load and filter compartment in the Power Genius XL can be safely operated to 110°C, at which point the amp will issue a fault and shut down.

This fan also obeys an algorithm that follows the accumulated key-down time; as the amount of key-down time in the last 120 seconds increases, the fan speed increases. All these inputs work together to ensure that the Harmonic Load and Filter unit is always adequately cooled.

In all cases, fan speeds are continuously adjusted to keep the amplifier within safe temperature limits.

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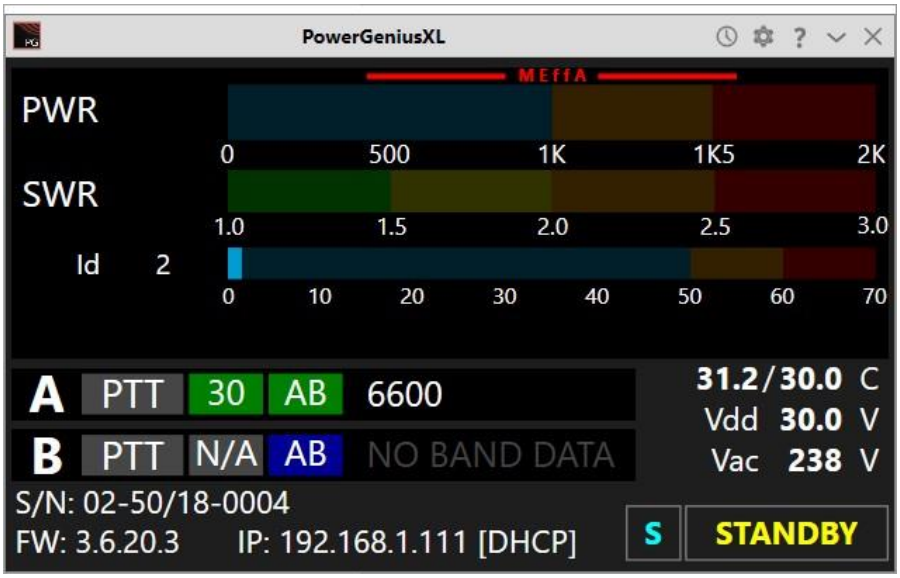
9 The Power Genius XL Utility

In addition to the amplifier configuration tasks described in the previous sections, the ***Power Genius XL Utility*** provides several other features.

9.1 Utility Front Panel Display

The ***Power Genius XL Utility*** provides an active remote version of the amplifier's front panel display.



The screen's title bar includes a button that opens the configuration screens, a button that opens the program version/information screen and a button that opens the usage chart (see section **9.7, Usage Chart**).

9.2 Standby Operate Mode

The utility application provides a **STANDBY/OPERATE** button in the lower right corner of the screen. Clicking this button changes the amplifier from **STANDBY** mode to **OPERATE** mode and back.

9.3 Active Fan Profile

Just to the left of the **STBY/OPER** button is a small button that allows you to change the active fan profile. Click this button to change the fan profile to Standard (**S**), Contest (**C**), or Broadcast (**B**). The change to the fan profile takes place immediately but is not recorded in the amplifier's memory. The next time the amplifier is started, it will revert to the fan mode set using the **Other** tab on the Configuration dialog. To make the fan mode change permanent, use the **Save** button on the Configuration screen.

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9.4 MEffA Indicator

Immediately above the PWR meter, you will see the MEffA indicator. Clicking on the indicator will toggle the MEffA system on and off. As with the fan mode button, the change is not recorded in the amplifier's configuration memory. To make the MEffA mode change permanent, use the **Save** button on the Configuration screen.

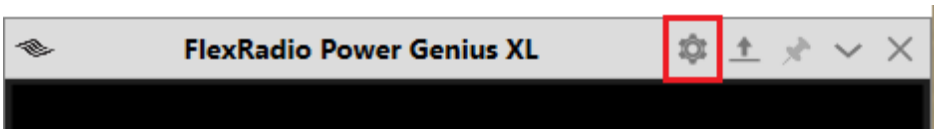
When MEffA is in operation and the amplifier is operating in class AB, the indicator is shown in red. When MEffA is configured, but the amplifier is operating in class AAB, the indicator is dimmed showing that MEffA operation does not apply to class AAB operation. When the MEffA indicator is not shown, MEffA is disabled.

9.5 Band Data Selection

Using the ***Power Genius Utility*** program, right-click on the band data source field on the display as shown below. A drop-down menu will appear allowing the user to select the desired band data source. To make this choice permanent, open the Device Settings screen and click Save. See section **4.4.4**, **PTT and Band Data** for more information.

9.6 Amplifier Configuration Dialog

Clicking the Configuration button (gear icon) at the top right of the ***Power Genius XL Utility*** screen opens a sub-menu that offers three options, **Always on Top**, **Device settings** and **Upgrade firmware**. Choose the desired option.



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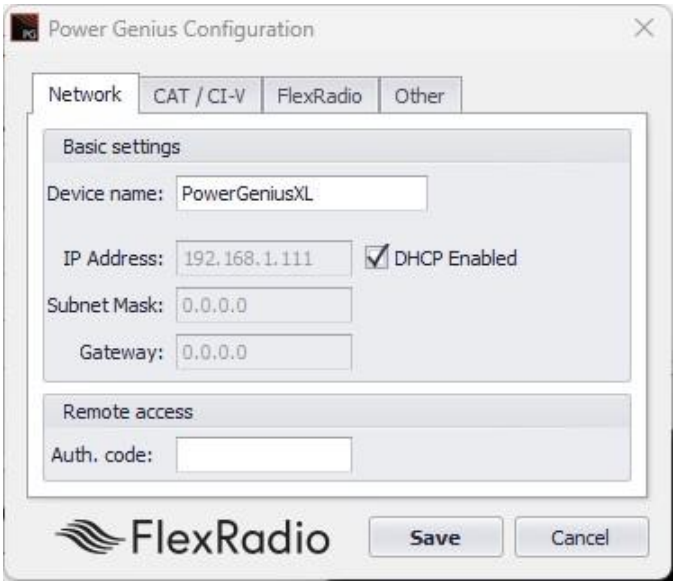
9.6.1 Network Tab

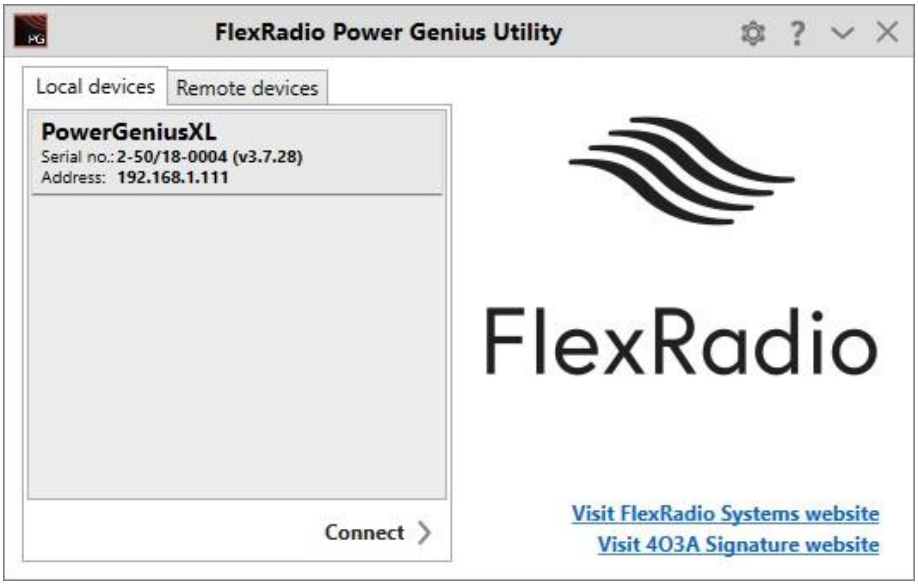
The **Network** tab is used to configure the device name and the amplifier network interface.

9.6.1.1 Device Name

The ***Power Genius XL Utility*** supports creating a custom "Device Name" for an amplifier. This name is simply a short text string that is associated with a specific amplifier. It can be set, changed, and cleared on the Network tab of the Configuration screen, as shown below:



The nickname will appear in the utility program's chooser, as shown below and in the title bar of the utility program's main screen:



i – The default nickname is "PowerGeniusXL."

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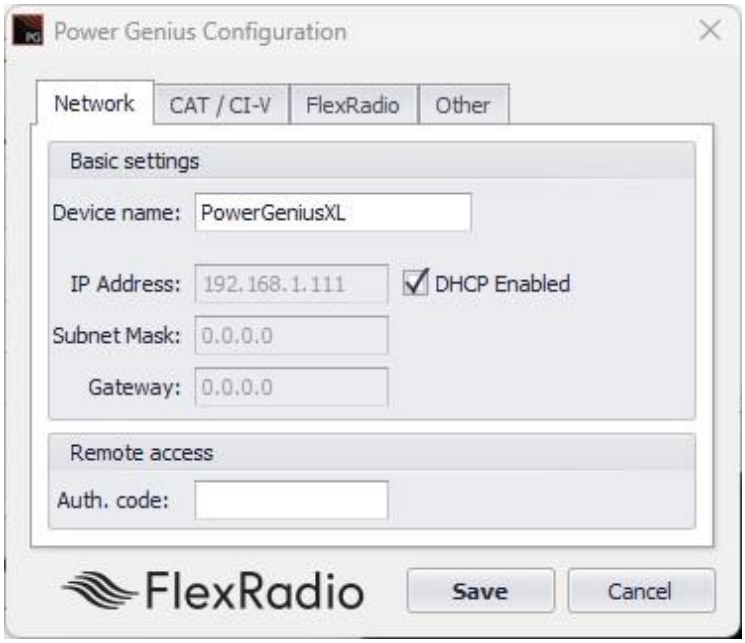
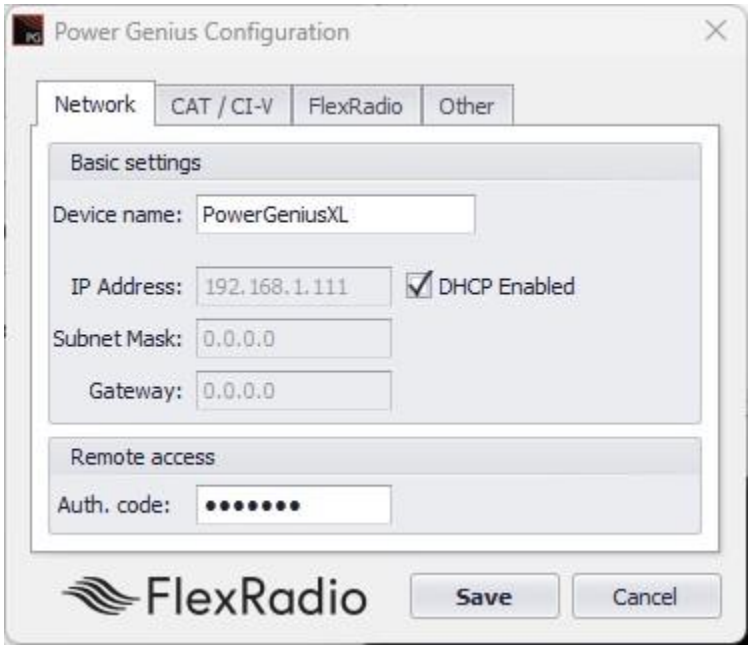
9.6.1.2 Basic Settings



You can select between a DHCP supplied IP Address or configure the amplifier to use a static IP address. See section **9.5.1, Network Tab** for details.

9.6.1.3 Remote Access

Remote access to the amplifier (access from an internet location not in your local area network) can be obtained by setting a remote access code in the Network tab:



Set the authentication code (Auth. code) to a character string between 1 and 8 characters in length.

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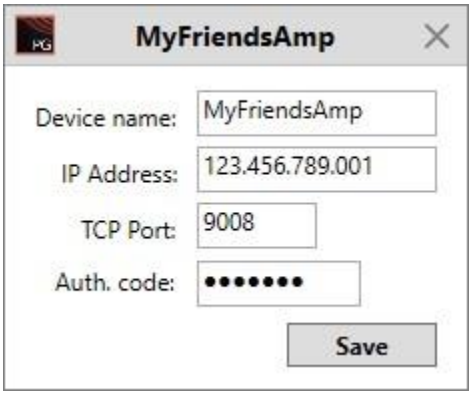
Configure a remote amplifier by selecting the “Remote Devices” tab in the amplifier chooser:

Configure the remote devices chooser by selecting the “+” icon, then entering the information about the remote amplifier:



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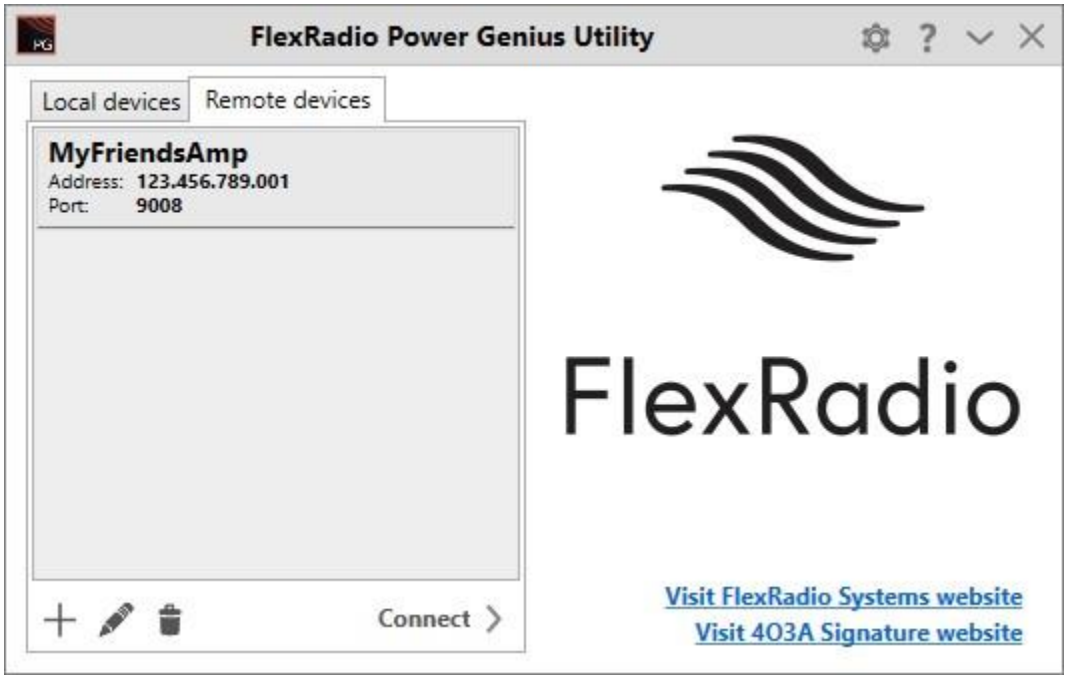
Connect to a remote amplifier by selecting the desired amplifier in the chooser:



Selecting the “pencil” icon allows you to modify an existing configuration. Selecting the “trash can” icon deletes a configuration.

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9.6.2 CAT/CI-V Tab

Use the **CAT / CI-V** tab when a FlexRadio 6000 Series transceiver does not control the amplifier. Choose the CAT protocol dialect associated with the transceiver. See section **3.4, Configuring for Use with Other Exciters** for more details. Choose the communication parameter settings. Do not use this tab to configure FLEX-6000 Signature Series transceivers. Click the **Save** button after the choices have been made.

Enabled: Each of the port configuration windows contains an enable switch. When this switch is off (not checked), the amplifier will ignore any radio configured for that port. The configuration fields will be dimmed and no changes to the configuration, if any, can be made. Click the **Enabled** check box to activate the configuration information for the amplifier port. The ports can be enabled and disabled without altering the configuration information.

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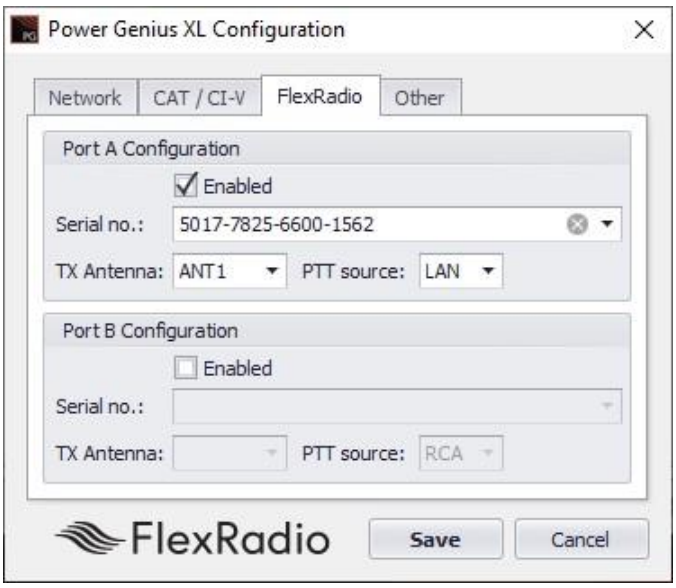
9.6.3 FlexRadio Tab



Use the **FlexRadio** tab to configure the amplifier to pair with FLEX-6000 Signature Series transceivers.

Before beginning this configuration, make sure your FLEX-6000 Signature Series transceivers are turned on and connected to the same Local Area Network that hosts the Power Genius XL. ***The Power Genius XL Utility*** will discover the FLEX-6000 Signature Series transceivers over the network.

Each of the port configuration windows contains an enable switch. When this switch is off (not checked), the amplifier will ignore any Flex radio configured for that port. The configuration fields will be dimmed and no changes to the configuration, if any, can be made. Click the **Enabled** check box to activate the configuration information for the amplifier port. The ports can be enabled and disabled without altering the configuration information.

You must select the serial number of the radio connected to each port. Leave the serial number field blank if you do not want that port paired with a FLEX-6000 Signature Series transceiver.

Select the antenna port from the FLEX radio (ANT1 or ANT2) that is connected to the amplifier port (A or B)

Be sure to select LAN for the PTT source; using RCA as the PTT source for FLEX-6000 Series transceivers is not recommended.

Click the **Save** button to store the configuration after the choices have been made.

i – The amplifier will reboot when Save is pressed.

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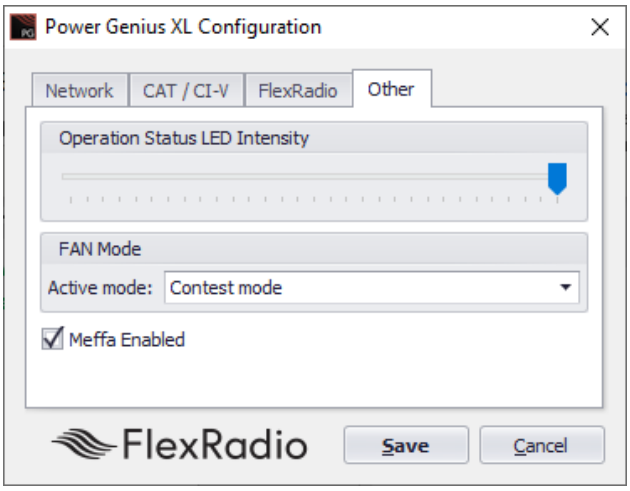
9.6.4 Other Tab

Use the **Other** tab to adjust the front panel backlight intensity, the cooling fan operational mode, and the default MEffA state.



Operation Status LED Intensity

This control sets the intensity for the LEDs on the front panel. The LED brightness does not change when moving the control. You must click the save button to see the change in brightness.

Thermal (Fan) Profiles

- **Standard**– the fans run at low speed, increasing speed with temperature but optimized for the lowest fan noise. Standard mode is recommended for casual SSB, CW, and digital operation.
- **Contest** – the fans run at a higher initial speed, increasing speed with temperature. Fan noise is louder than in Standard mode. Contest mode is recommended for contesting or extended SSB, CW or digital operation.
- **Broadcast** – the fans run continuously at high speed, regardless of temperature. Broadcast mode is recommended for extended high power RTTY and digital mode operation or high duty cycle SO2R contesting.

MEffA

The MEffA checkbox enables or disables the default state of the MEffA feature. See section **5**, **Maximum Efficiency Algorithm (MEffA™)** for more information.

i – You must press Save and reboot the amplifier to change the Status LED intensity.

i – Please don't confuse Status LED intensity with the brightness level control for the front panel display. The front panel display operates at a fixed brightness and will drop into a screen-saver mode after a period of inactivity.

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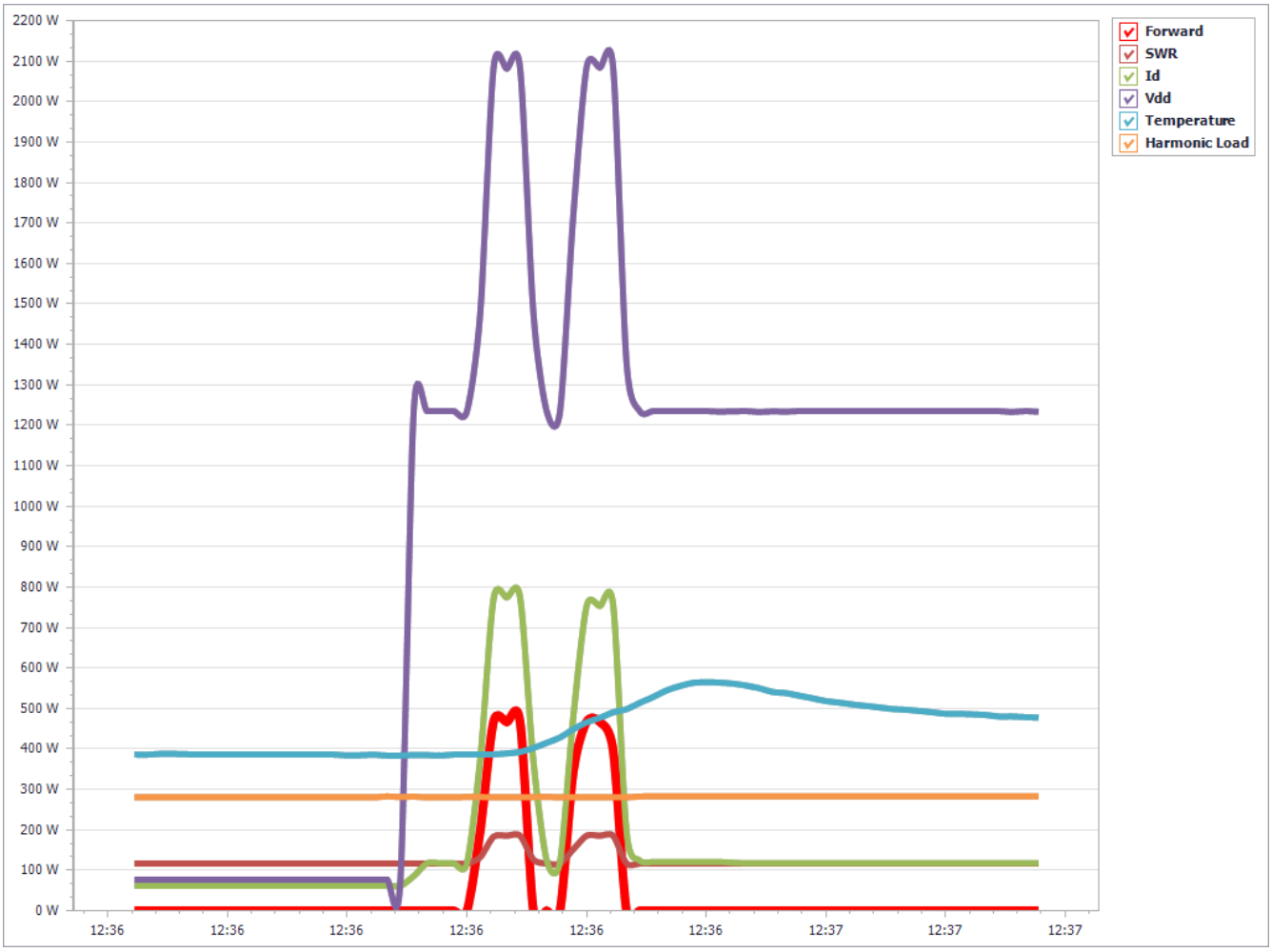
9.7 Usage Chart

The ***Power Genius XL Utility*** collects operational data from the amplifier and can chart that data on a graph over time. The Usage Chart button in the utility's menu bar displays the chart.

In the following example chart, we see two transmissions over a brief period.



i – Up to 2 hours (120 minutes) of data is collected and stored on the PC hard drive.

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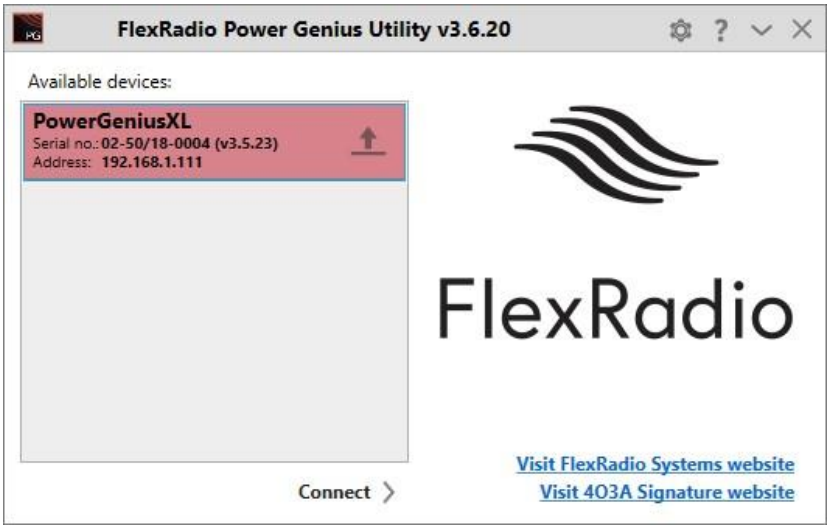
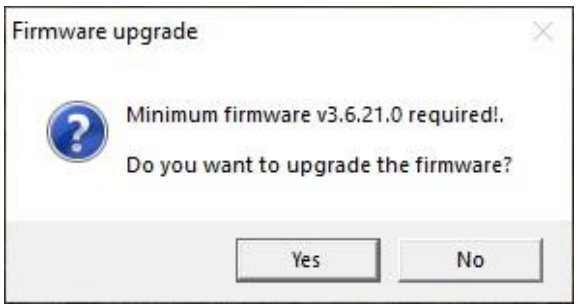
10 Firmware Upgrade Procedure

The ***Power Genius XL Utility*** is a package of programs that includes an amplifier firmware image that corresponds to the version of the Utility program. To upgrade the amplifier's firmware, install the new ***Power Genius XL Utility*** program, then start the Utility program and connect to the amplifier.

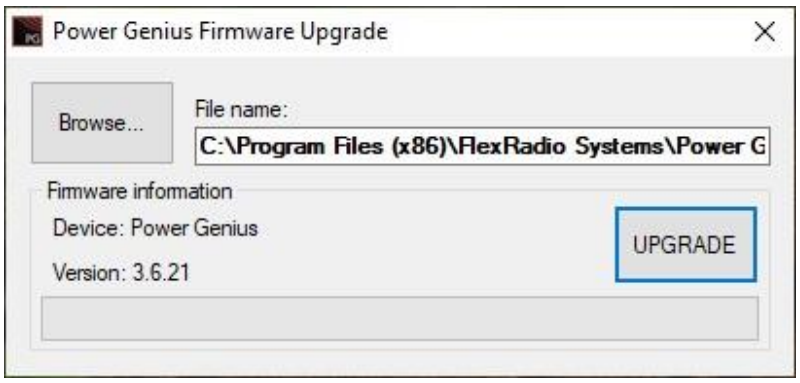
If the ***Power Genius XL Utility*** finds that firmware running the amplifier is out of date, it will display a screen like the following:



and will ask a question like:



If you answer "no" to this question, the Utility program will not connect to the amplifier, but the amplifier will continue to run. If you answer "yes", a screen like the following is displayed:



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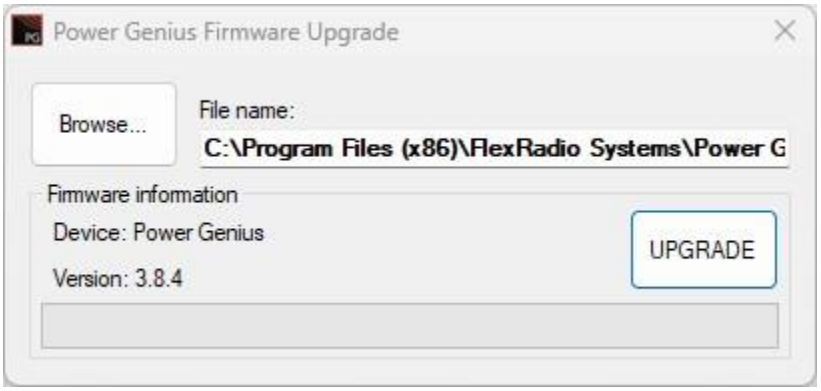
Clicking the UPGRADE button will cause the Utility program to install the firmware associated with the installed version of the Utility program. After installation, the amplifier will reboot, and the Utility program will connect to the amplifier.

When the amplifier is running and the Utility program is connected, the firmware can be upgraded with the following procedure:

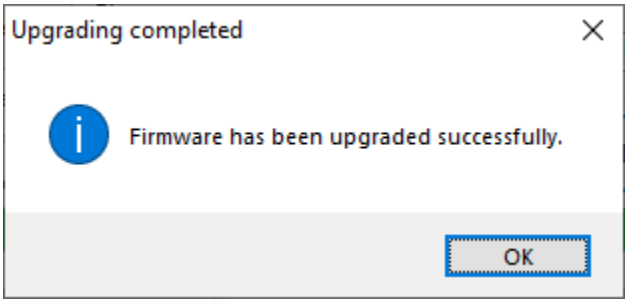
1. If the amplifier is in **OPERATE** mode, click the **STBY/OPER** button to change to **STANDBY** mode.
2. Click the settings button (the gear icon) to open the settings drop-down menu. Select "Upgrade firmware" from the menu.

3. The Power Genius Firmware Upgrade dialog will appear:



4. Click the Browse button on the Firmware Upgrade dialog, navigate to the firmware image, select it, and then click the UPGRADE button to start the firmware update process. Note that the dialog defaults to selecting the firmware image that was loaded with the Utility program.

   - The Power Genius XL microprocessor will enter its boot loader.
   - The color of the LED status lights on the Power Genius XL will change to purple.
   - The firmware image will be transferred over the network to the amplifier.
   - The amplifier will reboot.



   - When the firmware transfer is complete, a status dialog will be shown.

5. Click the OK button to close the notification dialog box.

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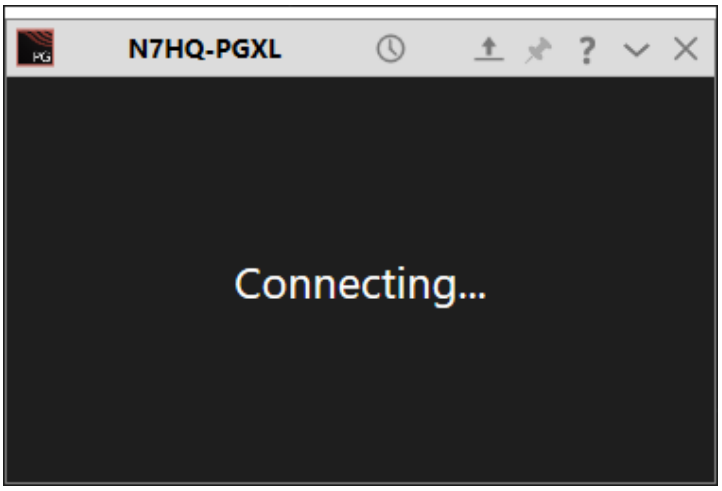
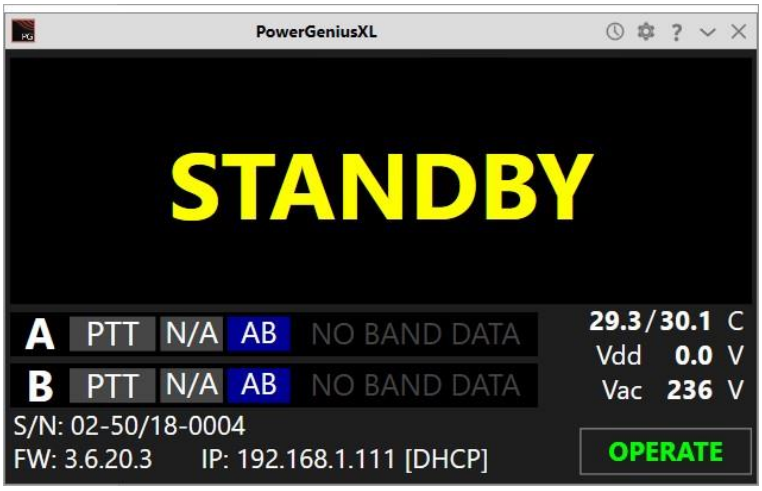
6. Close the Firmware Upgrade dialog box by clicking the X in the top right corner.



During the reboot, the ***Power Genius XL Utility*** screen may show that it is connecting. After the reboot is complete, the amplifier will reconnect, enter Standby mode, and you may resume regular operation.



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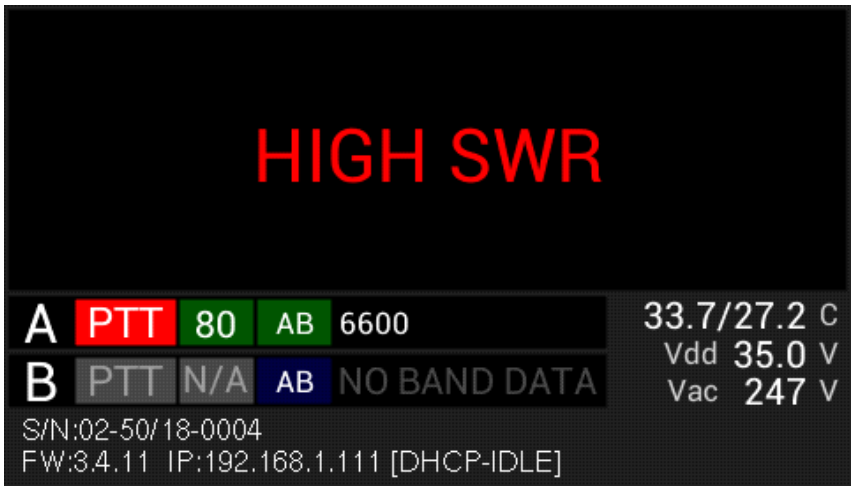
11 Factory Reset of the Power Genius XL

The configuration of the Power Genius XL can be reset to the "factory defaults" using the following procedure:

- Turn the amp off using the power switch on the back panel.
- Press and hold **STBY/OPER** front panel button.
- Turn the amplifier ON.
- When you see a blue circle on the front-panel display, release the STBY/OPER button.
- Tap the blue circle with your finger. Another blue circle will be displayed at a different position on the display - tap it. Do this a total of three times. This step calibrates the front panel touch screen. After the three blue circles are touched, the amplifier will reboot to save the touch screen calibration.
- Set all configuration options as desired using either the Utility or the front panel touch screen as described in section **3**, **Power Genius XL Setup, Configuration, and Testing**.

12 Alarms

If the amplifier detects an operational error, a message is displayed on the main display, as shown below:



The alarms and their meanings are shown in the following list:

Alarm Message	Description
HIGH SWR	High SWR has been detected on the output port.
WRONG BAND	Band data not detected. Check your band data settings/connections/sources.
RF EARLY	An RF signal arrived at the amplifier after the PTT signal, but before the amplifier was ready to transmit.
CB NOT ALLOWED	Attempted operation in the 11-meter Citizen's Band
PLEASE UNKEY	The amplifier needs to make a change that can only be done when it is unkeyed.

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When an alarm is raised, the amplifier disengages to protect itself from damage. The alarm is cleared when the PTT is released.

13 Specifications

PA Specifications

- RF Power Output 1500W (ICAS)
- Exciter Drive Level Up to 70W for 1500W on 160 to 10 meters, 100W on 6 meters
- Drive Transistors 2 - NXP MRF1K50H
- Exciter Inputs 2 – SO-239
- Antenna Outputs 2 – SO-239
- Antenna Impedance 50 ohms unbalanced
- Cooling Thermostatically Controlled Fans

Mechanical Specifications

- Dimensions 6” H x 14” W x 20” D, 15.5cm H x 35.5cm W x 51 cm D
- Weight 38 pounds, 17 Kg
- Shipping weight 47 pounds, 21.5 Kg
- Operating Temperature -25°C to +60°C

Electrical Specifications

- Supply Voltage and Current 90 – 250VAC, 50/60Hz, up to 15A
- Power Supply Internal Modular/Switching

14 FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation

FCC ID: 2AK7NSKYPower Genius XL001

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15 Appendix

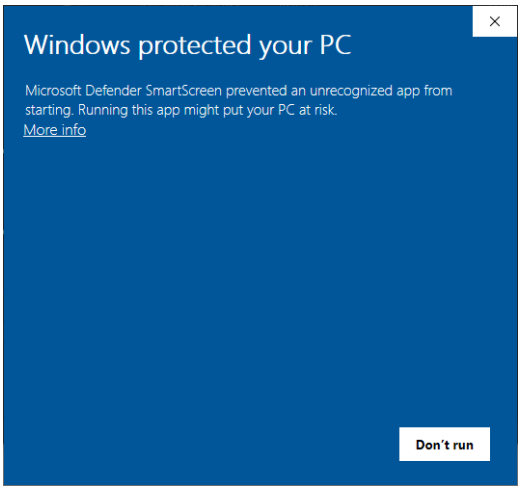
15.1 Installing the Power Genius XL Utility

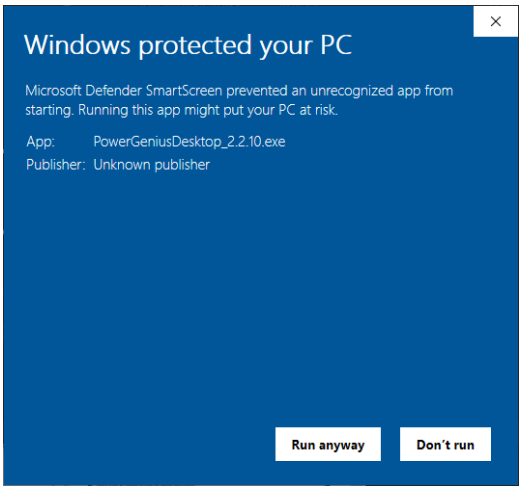
The ***Power Genius XL Utility*** program is an integral part of the amplifier system. The program is used to configure the amplifier, update the amplifier's firmware, and operate it remotely. Section **9, The Power Genius XL Utility** describes the program's features and usage in detail.

Download the installer for the program from the FlexRadio website and install the program on a Windows PC located on the same local area network (LAN) as the amplifier.

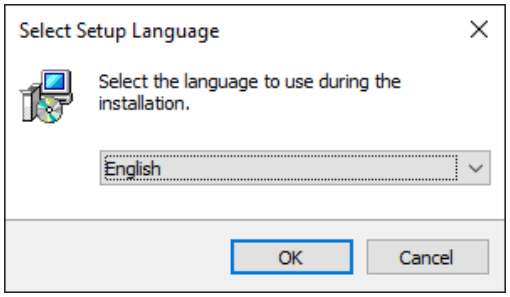
The installer can be found in the software section of the FlexRadio website:
https://www.flexradio.com/category/power-genius-xl/

During installation, if you encounter a message like the one below, please click on the **More info** link.





You can then click the **Run anyway** button to run the installer.



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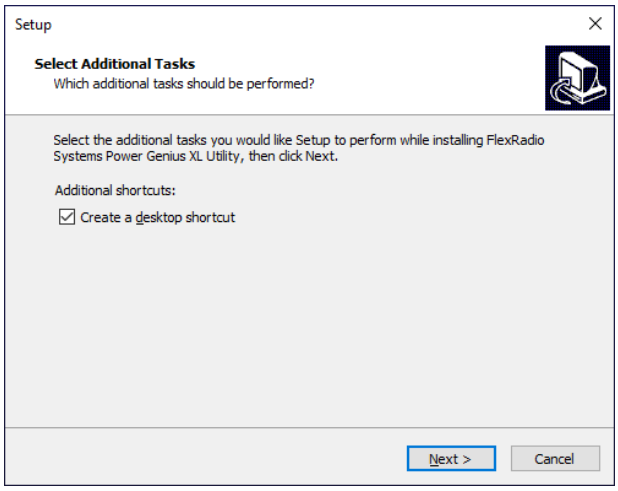
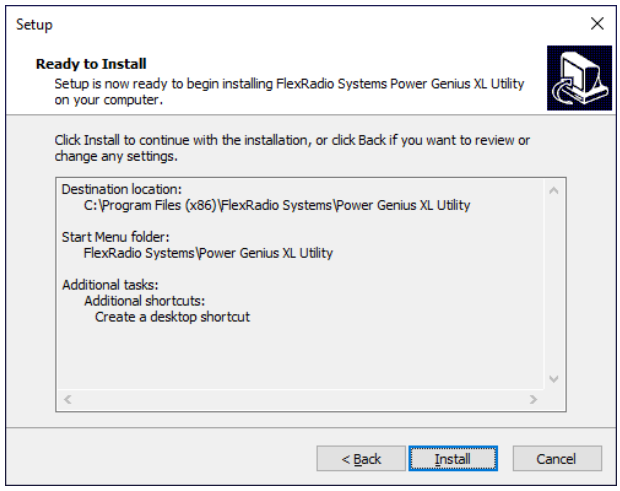
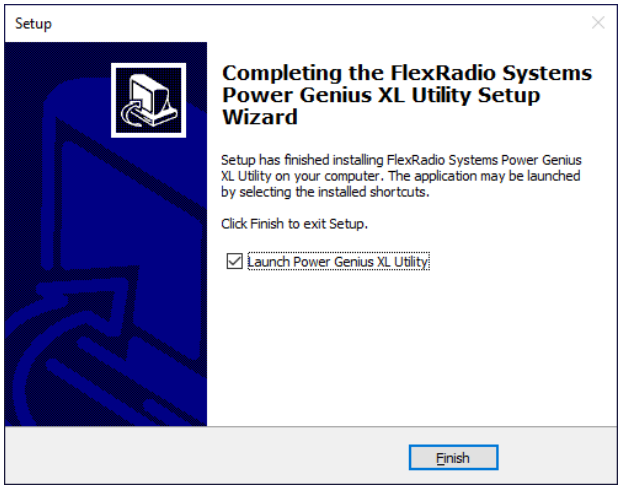
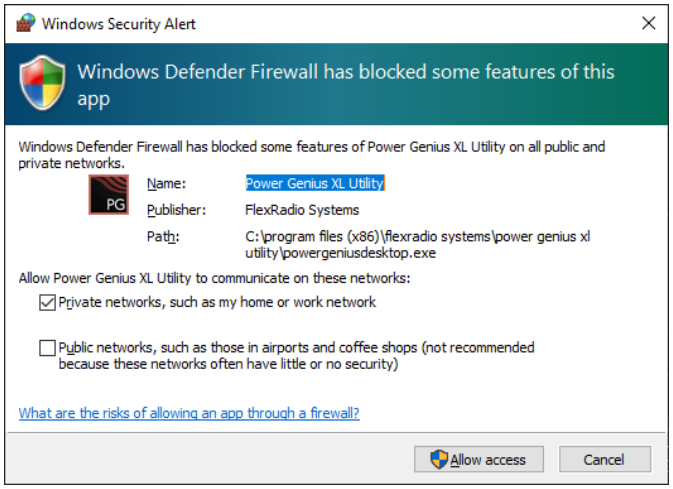
You will be presented with a dialog where you select the desired language and press, **OK.**





Decide if you want a desktop shortcut created, then press **Next >.** Finally, when ready, press **Install.**





When the installer completes, you will see a choice to run the ***Power Genius XL Utility***. Ensure that box is checked and click **Finish.**

When the utility runs the first time, Windows Firewall may query you for permission to open a port on your PC needed for the ***Power Genius Utility*** to communicate with the amplifier. You can choose to allow the application to function on Private Networks, Public Networks, or both network types. Click **Allow access** to complete the installation.

i – Windows Updates have, in the past, changed the network type from Private to Public without warning. If your PC is not a laptop you travel with, a best practice is to select both network types, to prevent problems if a Windows update alters your network type.

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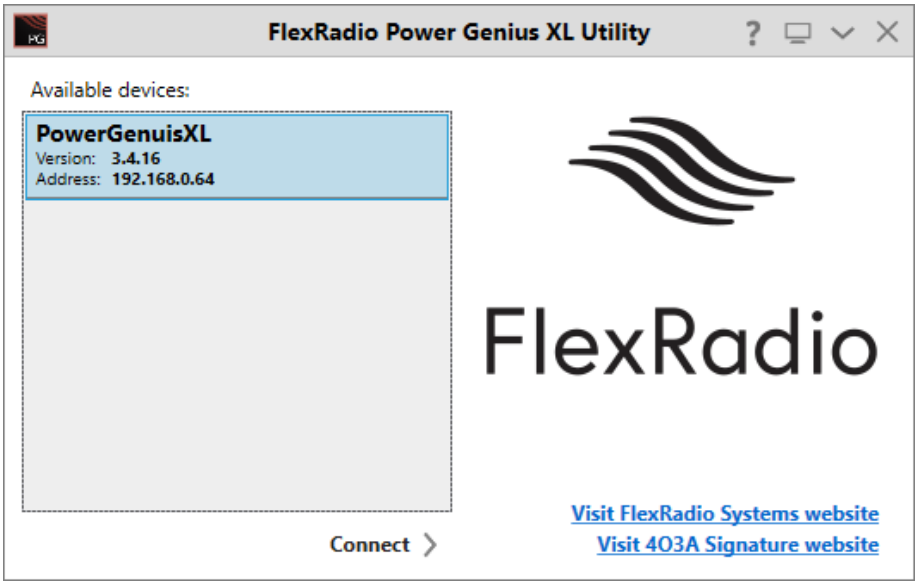

When the utility program completely loads, it will detect any Power Genius XL amplifiers active on your LAN, then display them in a list.

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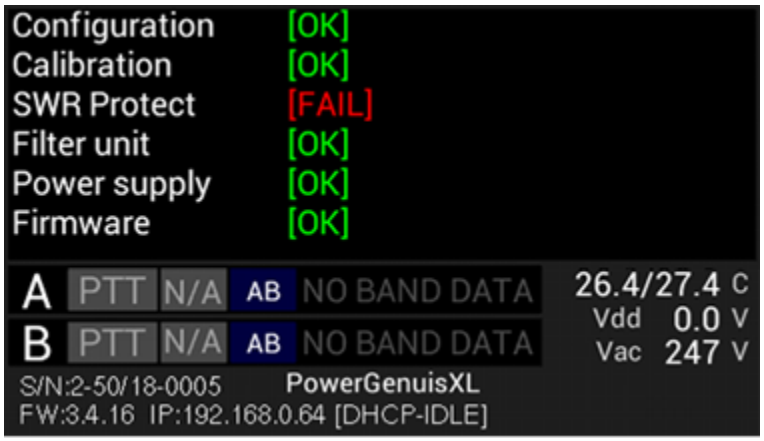
15.2 POST failures

When the amplifier starts, and when it transitions from Standby to Operate, it conducts a self-test. If any of the self-tests fail, a screen like the following will be displayed on the unit's front panel:



The meanings of the various possible failures are:

- **Configuration** – There are two possible meanings:
  - Errors were noticed when trying to read the amplifier's configuration settings from permanent memory. In some cases, performing a Factory Reset may resolve the problem. See section **11, Factory Reset of the Power Genius XL**. In other cases, the amplifier will need to be serviced.
  - An attempt was made to run a version of the amplifier firmware out of sequence. In general, the firmware requires that each new firmware release be installed and run in the order in which they were produced. Skipping over versions may result in this error.
- **Calibration** – Errors were noticed when loading the amplifier's stored calibration data. The amplifier will need to be serviced to resolve this error.
- **SWR Protect** – The amplifier's High SWR protection device malfunctioned. In many cases this error can be cleared by simply rebooting the amplifier. If the error persists, the amplifier will need to be serviced.
- **Filter unit** – The low pass output filter test failed. This error may be cleared by rebooting the amplifier, but if it persists, the amplifier will need to be serviced.
- **Power supply** – The amplifier's power supply is not responding to commands. This error may be cleared by rebooting the amplifier, but if it persists, the amplifier will need to be serviced.
- **Firmware** – The amplifier's firmware has detected an error it cannot correct. When this error occurs, the front panel display will also show a number that corresponds to the firmware fault. Please note this value and contact FlexRadio Support for assistance.

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