

AETECHRON



DSR Series

Dropout, Surge, Ripple Simulator
and AC/DC Voltage Source

Operation Manual

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2507 Warren Street, Elkhart, IN 46516

Limited One-Year Warranty

SUMMARY OF WARRANTY

AE TECHRON INC. of Elkhart, Indiana (Warrantor) warrants to you, the ORIGINAL COMMERCIAL PURCHASER ONLY of each NEW **AE TECHRON INC.** product, for a period of one (1) year from the date of purchase, by the original purchaser (warranty period) that the product is free of defects in materials or workmanship and will meet or exceed all advertised specifications for such a product. This warranty does not extend to any subsequent purchaser or user, and automatically terminates upon your sale or other disposition of our product.

ITEMS EXCLUDED FROM WARRANTY

We are not responsible for product failure caused by misuse, accident or neglect. This warranty does not extend to any product on which the serial number has been defaced, altered, or removed. It does not cover damage to loads or any other products or accessories resulting from AE TECHRON INC. product failure. It does not cover defects or damage caused by the use of unauthorized modifications, accessories, parts, or service.

WHAT WE WILL DO

We will remedy, at our sole discretion, any defect in materials or workmanship by repair, replacement, or refund. If a refund is elected, you must make the defective or malfunctioning component available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at our factory. Expenses in remedying the defect will be borne by **AE TECHRON INC.**, including one-way surface freight shipping costs within the United States. (Purchaser must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other customs fees for such foreign shipments.)

HOW TO OBTAIN WARRANTY SERVICE

When you notify us of your need for warranty service,

we will give you an authorization to return the product for service. All components must be shipped in a factory pack or equivalent which, if needed, may be obtained from us for a nominal charge. We will take corrective actions within a reasonable time of the date of receipt of the defective product. If the repairs made by us are not satisfactory, notify us immediately.

DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

You are not entitled to recover from us any consequential or incidental damages resulting from any defect in our product. This includes any damage to another product or products resulting from such a defect.

WARRANTY ALTERATIONS

No person has the authority to enlarge, amend, or modify this warranty. The warranty is not extended by the length of time for which you are deprived of the use of this product. Repairs and replacement parts provided under the terms of this warranty shall carry only the unexpired portion of this warranty.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

There is no warranty that extends beyond the terms hereof. This written warranty is given in lieu of any oral or implied warranties not contained herein. We disclaim all implied warranties, including, without limitation, any warranties of merchantability or fitness for a particular purpose. No action to enforce this Warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

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Figure 1.1 – DSR100-15 System



Figure 1.2 – Left to right: DSR100-50, DSR100-100, DSR100-150 and DSR100-200

1 About the DSR Series Test Systems

Congratulations on your purchase of an AE Techron DSR Series test system, designed for use in EMC testing as a dropout, surge, ripple simulator and AC/DC voltage source. A DSR test system provides a complete, single-box solution for immunity testing. It includes a simple-to-use yet powerful 3110 Standards Waveform Generator matched with an industry leading power supply technology and comes with an extensive library of tests for many automotive and aviation standards.

The DSR system is 4-quadrant, allowing it to source and sink current. The DSR system has power in reserve; each model provides continuous DC power as rated, and is able to provide 4X rated power for in-rush testing up to 200 mS, as is required in DO 160 Section 16.

The AE Techron brand is known throughout the world for its robust precision amplifiers and test systems as well as its product service and support.

1.1 Disclaimer

Although AE Techron has made substantial effort to ensure the accuracy of the Standards' test files (SWG files), which are included with the DSR100-series cabinet, no warranty, expressed or implied, is made regarding accuracy, adequacy, completeness, legality, reliability or usefulness of the information provided. It is the responsibility of the user to ensure the accuracy and applicability of these test files for their intended purposes.

2 System Setup

2.1 Safety First

Throughout these instructions, special emphasis is placed on good safety practices. The following graphics are used to highlight certain topics that require extra precaution.



DANGER

DANGER represents the most severe hazard alert. Extreme bodily harm or death will occur if these guidelines are not followed. Note the explanation of the hazard and instruction for avoiding it.



WARNING

WARNING alerts you to hazards that could result in severe injury or death. Note the explanation of the hazard and the instructions for avoiding it.



CAUTION

CAUTION indicates hazards that could result in potential injury or equipment or property damage. Once again, note the explanation of the hazard and the instructions for avoiding it.

2.2 Unpacking and Installing

2.2.1 DSR 100-15 Model

Carefully unpack the DSR 100-15 and accessories from the two cartons and visually inspect the contents for damage. All units are tested and inspected for damage before leaving the factory, so if any damage is found, please notify the shipping company immediately. Save the shipping cartons and materials as evidence of damage.

2.2.2 All Other DSR Systems

Your system will be delivered to the ship-to address enclosed in a wooden crate and transported on a special, shock-absorbing pallet. With the addition of packaging, the cabinet can weigh from 300 pounds (DSR100-50) to more than 950 pounds (DSR100-200). (Or from 136 kg to more than 430 kg). To avoid serious injury and/or product damage, use a heavy-duty lift or other suitable equip-



WARNING

Never attempt to lift the cabinet without assistance. Crushing bodily injury can result if care is not taken during installation. Cabinets may overturn if not secured.

ment to unpack and move the product to its place of installation.

To uncrate the product, remove the top and one side of the crate, then use a lift or other suitable equipment to glide the cabinet from the crate and off the pallet. Cable lift rings are installed at the cabinet top corners of the heaviest cabinets to facilitate product removal (see **Figure 2.1**).



Figure 2.1 – Cable Lift Rings

The cabinet has been tested and inspected for damage before leaving the factory. Carefully unpack and inspect the product for damage. **Please note any damage for future reference and notify the shipping company immediately if damage is found.** Also, please save the shipping crate and pallet as evidence of damage and/or for returning the cabinet for repair.

2.3 Check Contents

In addition to the DSR system, your shipment should include the following:

1. LCD monitor
2. Monitor power cord
3. HDMI-to-DVI monitor cable
4. USB mouse
5. USB keyboard
6. Male pin-plug connectors (2)
7. Ethernet cable
8. Mouse pad
9. System power cord (DSR 100-15 only)
10. Quick Start Guide
11. DSR Series Operation Manual on USB drive

2.4 DSR System Location

The DSR 100-15's case features heavy-duty handles to allow the user to move the system from bench-top to bench-top. Locate the system near a 20AAC supply,

DSR cabinets are mounted on wheels to allow rolling on a flat, smooth surface. To avoid possible tipping, always push the cabinet from the front and avoid rough or pitted surfaces.

Locate your cabinet near a three-phase power source. Allow enough clearance at the front and back of the amplifier to allow adequate airflow and hot air discharge through the amplifier rear. See **Figure 2.2** for clearance recommendations

2.5 Connect the Signal Source

Your DSR system comes with a 3110 Standards Waveform Generator that includes an extensive library of tests for many automotive, aviation, and industry standards.* The 3110 provides a powerful yet simple-to-use interface to help streamline the testing process. 3110 test files (.swg) are easy to link, build from scratch, or customize using time-saving controls like triggers and loops with changing variables. Plus, the 3110's intuitive, drag-and-drop interface makes it easy to modify existing tests or build new tests.

The 3110 can produce standard signals and waveforms with or without a DC offset. Frequency, amplitude and DC offset can be fixed or swept, and sinewave sweeps can be linear, logarithmic or exponential. It can create dropouts and surges and can also produce ripple waveforms of up to 300 kHz.

However, the 3110 is not the same as a standard function or arbitrary waveform generator. When functions or capabilities are required that are not available using the 3110 Standards Waveform

*Some Standards' tests included in the 3110 Library may require voltages above the maximum voltage available in your DSR Series system. To run those tests, connect the 3110 to a different amplifier or amplifier system that can generate the required voltage.

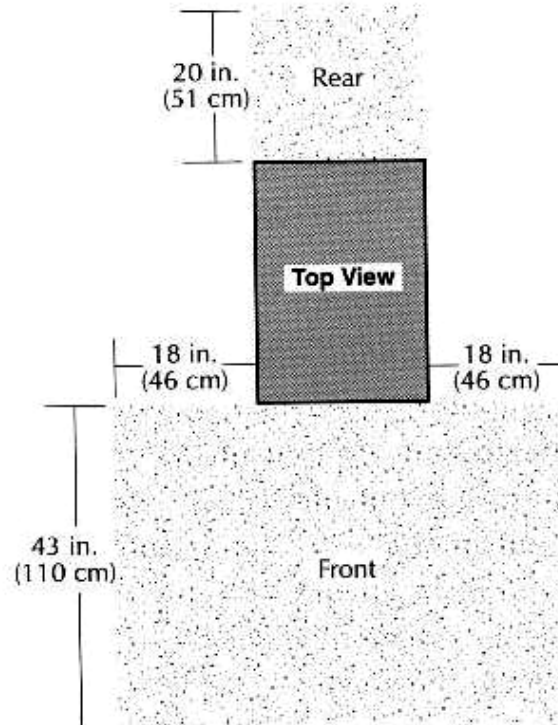


Figure 2.2 – Clearance Recommendations for Cabinet Placement

Generator, a different signal source can be connected for use with the DSR system. See the topic “Using a Stand-alone Signal Source for Signal Generation” for more information.

2.5.1 Using the 3110 Standards Waveform Generator for Signal Generation

Connect Peripheral Equipment

DSR 100-15 Connections: Complete the following steps to connect the 3110 cables and accessories provided to the DSR 100-15 back panel. Refer to **Figure 2.3** for component locations.

- Plug the USB keyboard into the USB port labeled KEYBOARD on the DSR 100-15 back panel.
- Plug the USB mouse into the USB hub
- Plug the USB hub into the port labeled MOUSE on the DSR 100-15 back panel.
- Plug the HDMI to DVI cable into the HDMI port labeled MONITOR on the DSR 100-15 back panel, and then connect the cable to the DVI port on the monitor.

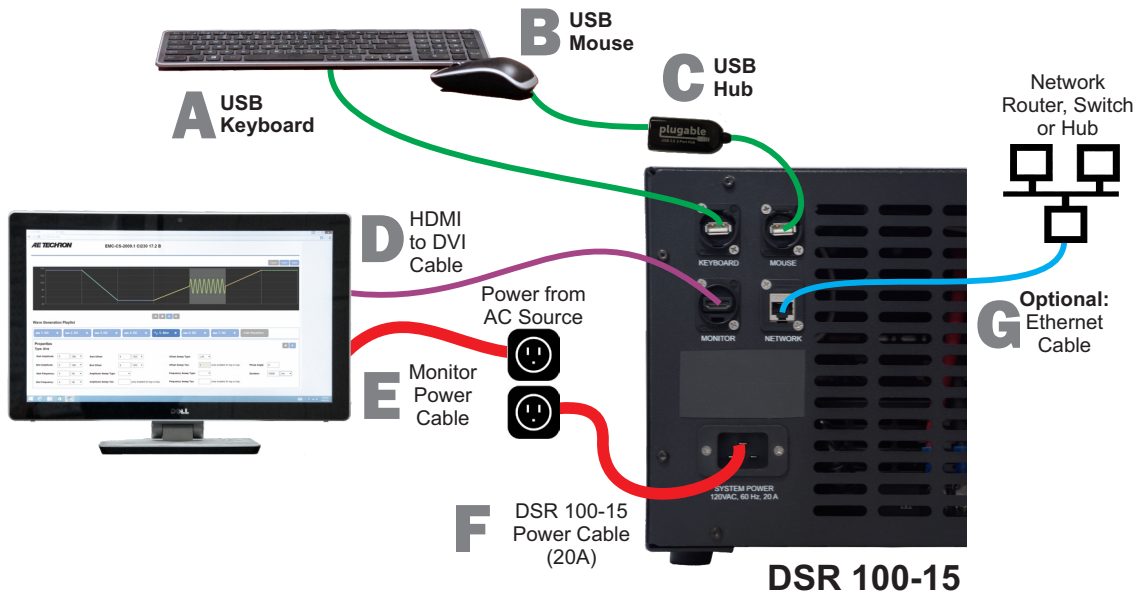
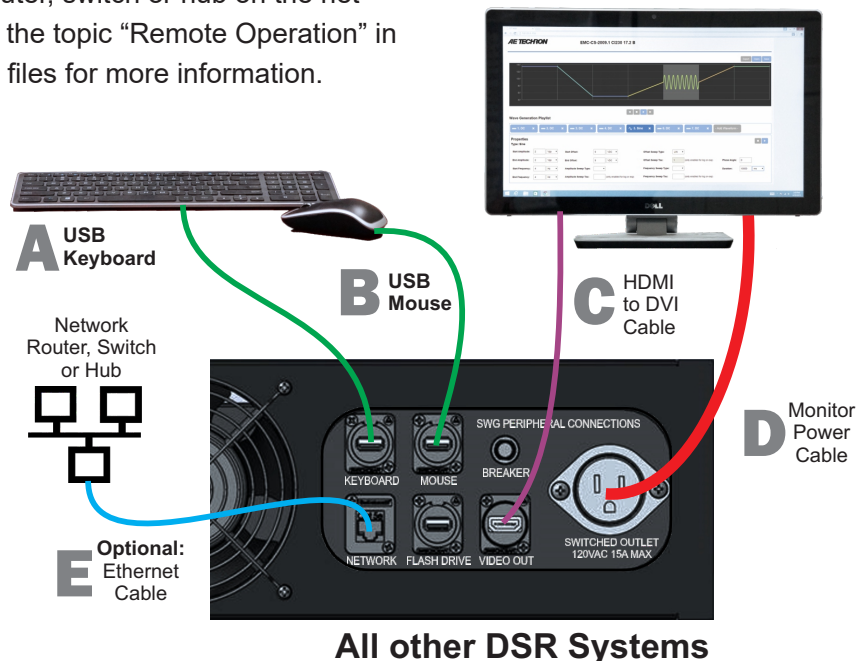


Figure 2.3 – Connecting the 3110 Cables and Accessories on the DSR 100-15

- E. Plug the monitor power cord into the monitor, and then connect the cord to a power source.
- F. Plug the DSR 100-15 power cord into the power connector located on the DSR 100-15 back panel, and then connect the cord to a 20A power source.
- G. **OPTIONAL:** To connect the DSR 100-15 to be accessed and controlled through a network: Plug the Ethernet cable to the Ethernet port labeled NETWORK, and then plug the Ethernet cable into a router, switch or hub on the network. Refer to the topic “Remote Operation” in the *3110 Help* files for more information.

Connections for Other DSR Systems: Complete the following steps to connect the 3110 cables and accessories provided to the DSR Series’ SWG Peripheral Connections panel located on the cabinet back. Refer to **Figure 2.4** for component locations.

- A. Plug the USB keyboard into the USB port labeled KEYBOARD
- B. Plug the USB mouse into the port labeled MOUSE.



All other DSR Systems

Figure 2.4 – Connecting the 3110 Cables and Accessories on a DSR Series Cabinet

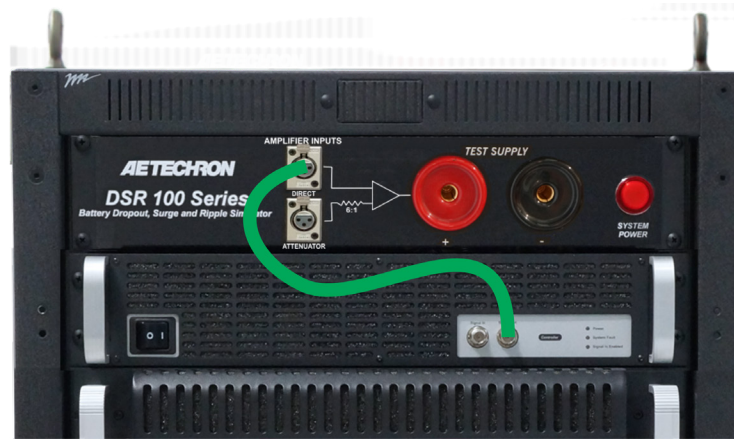


Figure 2.5 – Connecting the 3110 to the Direct Amplifier Input

- C. Plug the HDMI to DVI cable into the HDMI port labeled MONITOR and then connect the cable to the DVI port on the monitor.
- D. Plug the monitor power cord into the monitor, and then connect the cord to the cabinet's auxiliary 120V AC switched power outlet. If you prefer, you can connect the monitor to an alternate power source.
- E. **OPTIONAL:** To connect the DSR system to be accessed and controlled through a network: Plug the Ethernet cable to the Ethernet port labeled NETWORK, and then plug the Ethernet cable into a router, switch or hub on the network.

Note on Network Control of the 3110: After network control of the 3110 has been implemented, the monitor, keyboard and mouse can be disconnected from the 3110 and the system can be operated remotely. See the topic “Remote Operation” in the **3110 Help** files for more information.

Connect 3110 Signal Output

Use a BNC cable to connect from the 3110's front-panel BNC connector labeled Signal Out to one of the two DSR system's BNC connectors labeled Amplifier Inputs. See **Figure 2.5**.

DIRECT AMPLIFIER INPUT: The Direct Amplifier Input sends a 1:1 signal to the system amplifier(s). Maximum input voltage is 10V.

ATTENUATOR AMPLIFIER INPUT: The Attenuator Amplifier Input sends the signal through a 6:1 attenuator before sending to the system amplifiers. For every 6V received at the Attenuator connector, 1V will be sent to the system amplifier(s). Most test sequences do not require the use of this attenuator. However, tests having a maximum voltage of less than 30V may require the use of the attenuator. In general, if you are experiencing noise during testing, use of the attenuator is recommended.

When using the Attenuator input, you must decrease the system gain setting in the 3110 to 1/6 of the calibrated setting (i.e., a gain of 20 would be set to 3.33 when using the Attenuator input). Lowering the gain of the system allows the user to achieve maximum system signal to noise performance. See the topic “Using the 6-to-1 Attenuator Input” for more information.

2.5.2 Using a Stand-alone Signal Source for Signal Generation

Your choice of stand-alone signal generation device can be used with your DSR system in place of the 3110 Standards Waveform Generator. Use a BNC cable to connect from the signal output connector on your alternate signal generation device to one of the two DSR system's BNC connectors labeled Amplifier Inputs. See **Figure 2.6**.

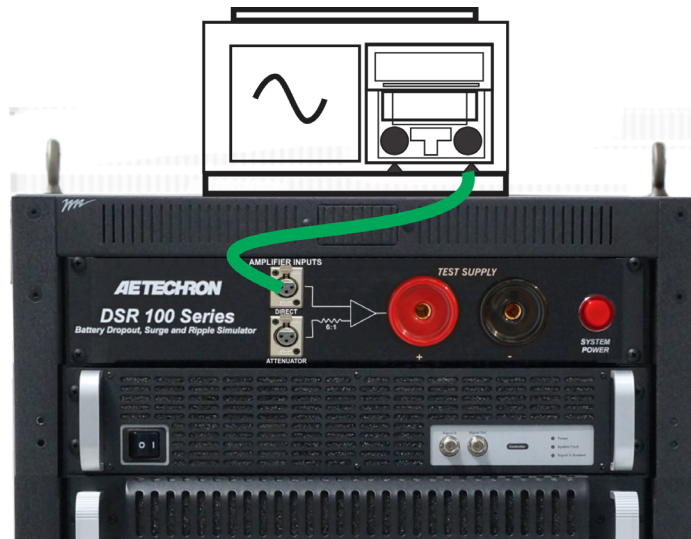


Figure 2.6 – Connecting a Stand-alone Signal Generator to the Direct Amplifier Input

DIRECT AMPLIFIER INPUT: The Direct Amplifier Input sends a 1:1 signal to the system amplifier(s). Maximum input voltage is 10V.

ATTENUATOR AMPLIFIER INPUT: The Attenuator Amplifier Input sends the signal through a 6:1 attenuator before sending to the system amplifiers. For every 6V received at the Attenuator connector, 1V will be sent to the system amplifier(s). Most test sequences do not require the use of this attenuator. However, tests having a maximum voltage of less than 30V may require the use of the attenuator. In general, if you are experiencing noise during testing, use of the attenuator is recommended. See the topic “Using the 6-to-1 Attenuator Input” for more information.

2.6 Connect the Test Supply

! WARNING

ELECTRIC SHOCK HAZARD.

Output potentials can be lethal. Make connections only with AC Power unplugged or switched off at the source and the system’s AC power switch in the OFF position.

Make sure the DSR system is turned off and AC power is disconnected. Using the supplied pin-plug connectors and wiring appropriate for your application, connect from the DSR system’s positive and negative test supply connectors to the device under test. See **Figure 2.7**.

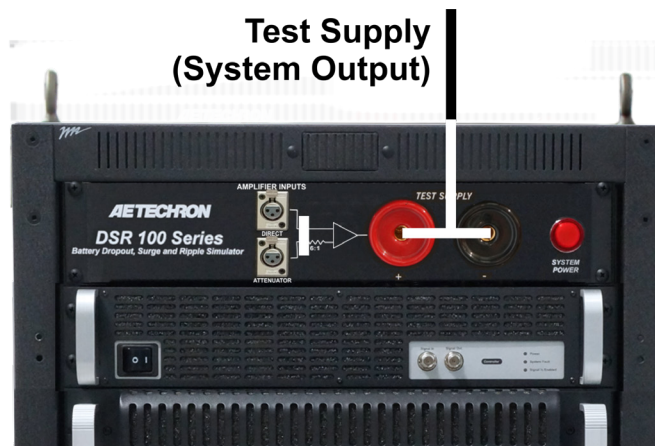



Figure 2.7 – Test Supply Connections (DSR System Output)

2.7 Connect the Power Source

2.7.1 DSR 100-15

Locate your system near a 120V AC source. Plug the supplied power cord into the power connector on the back of the DSR 100-15 system, and then connect to the 120V AC source. See **Figure 2.8**.

2.7.2 All Other DSR Systems

	WARNING
<p>ELECTRIC SHOCK HAZARD. Power supply wiring should only be performed by a qualified, licensed electrician.</p>	

Complete the following steps to connect the cabinet to a 208V (or optional 400V) three-phase power source:

1. Make sure that power is disconnected from the AC source.
2. Open the access door on the back of the cabinet.
3. Remove the right side panel from the cabinet. See **Figure 2.9**.
4. Locate and disconnect the four (4) wires connected to the lower rear fan panel. See **Figure 2.10**.
5. Remove the four (4) screws from the lower rear fan panel (see **Figure 2.11**). Remove the panel from the cabinet. Retain the panel and screws.
6. Route the AC power input cable into the cabinet through the strain relief opening located in the lowest cabinet back panel See **Figure 2.12**.
7. Locate the power distribution block at the bottom of the cabinet. Open the distribution block cover and connect the AC power line to the AC input terminals as shown (see **Figure 2.13**).
8. Reconnect the fan wiring as shown in **Figure 2.14**.
9. Remount the fan panel and secure using the retained screws.

2.8 Startup Procedure

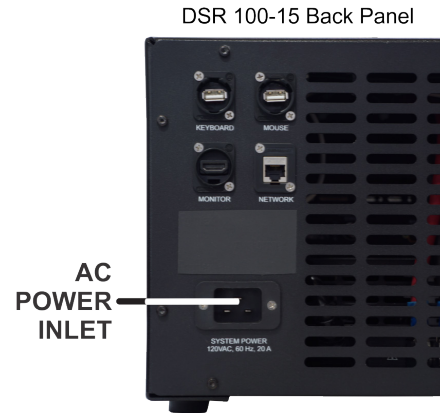


Figure 2.8 – Location of DSR 100-15 power inlet



Figure 2.9 – Removing the right side panel



Figure 2.10 – Fan panel connections



Figure 2.11 – Removing the fan panel

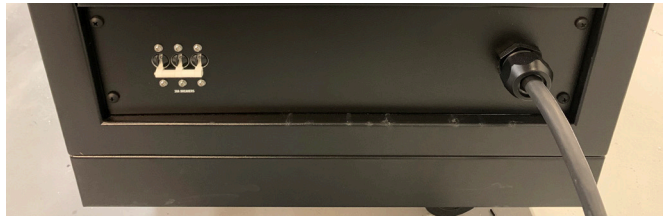


Figure 2.12 – Routing the AC power input cable

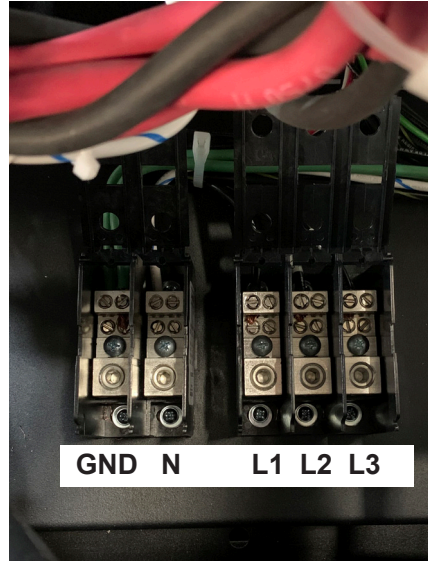
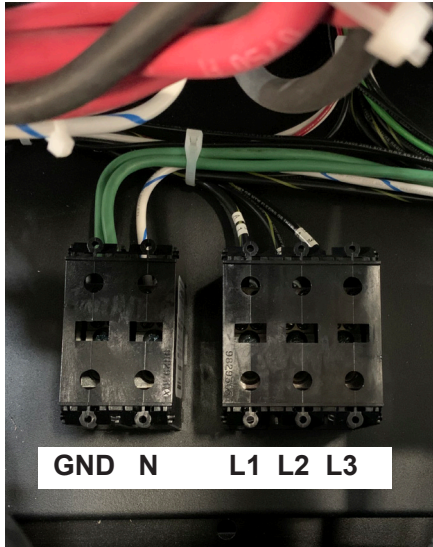


Figure 2.13 – Wiring the AC distribution block

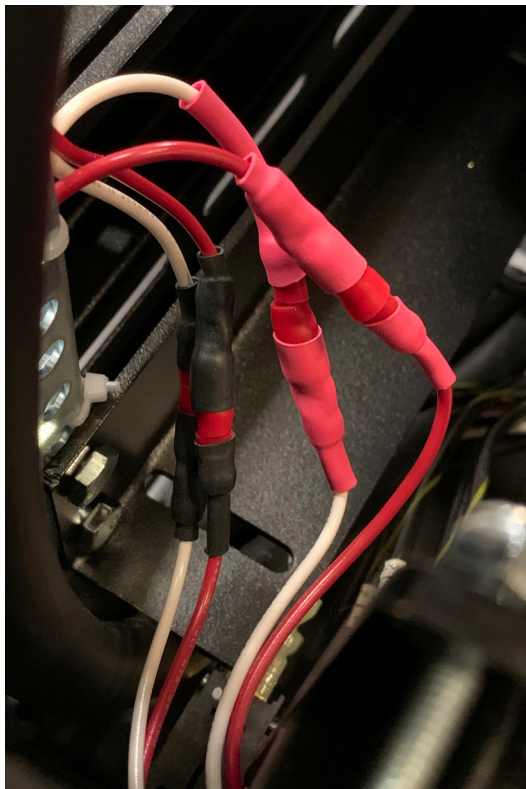


Figure 2.14 – Reconnecting the fan wiring

Complete the following steps to power up the DSR system.

- A. Use the monitor's power switch (last button on the right) to turn on the monitor.
- B. Check the power/breaker switch on the 3110 and all amplifier modules. Make sure all units are switched ON. See **Figure 2.15**.
- C. **DSR 100-15 ONLY:** Check the amplifier's gain control and make sure it is fully clockwise. See **Figure 2.15**.
- D. Depress the SYSTEM POWER switch to turn the DSR system ON.
- E. Wait for the 3110 interface to load (loading will take up to 30 seconds). Press the Help button to access this manual from within the program.
- F. Run the System Calibration test to determine the proper settings for your system. See the **"Calibration"** section in the **3110 Help** files for more information.

2.9 Shutdown Procedure

IMPORTANT: Any powered amplifiers that are connected to the 3110 must first be disabled before shutting down the 3110 or DSR System. Failure to follow the proper shutdown procedure can result in damage to the amplifiers or any connected load/DUT.

Complete the following to safely shut down a 3110/ amplifier combination or DSR System:

1. Make sure all amplifiers connected to the system are disabled. To quickly disable AE Techron amplifiers, press the Stop button on the front panel of any amplifier to place all connected units in Standby mode. Or you can turn the amplifier(s) OFF using the amplifier's

3110 Standards Waveform Generator



POWER SWITCH

DSR 100-15 Amplifier Module



BREAKER/POWER SWITCH

GAIN CONTROL

Amplifier Module for all other DSR Systems



BREAKER/POWER SWITCH

Figure 2.15 – System Component's Power/Breaker Switches and Gain Control (DSR 100-15 only)

power switch or breaker. See the "Operation" section in this manual for power switch location. For non-AE Techron amplifiers, consult the product instructions to determine the best method for disabling those units.

2. After all amplifiers have been disabled, turn the system OFF by pressing the System Power button.

NOTE: If the 3110 is not connected to any amplifiers, it can be safely shut down by simply pressing the 3110 front-panel power switch.

3 Operation

IMPORTANT: Before operating the DSR system, the **3110 System Calibration Procedures** should be performed to verify the correct System Gain and DC Offset settings for your system. See the topic “System Calibration” in the **3110 Help** files for more information.

3.1 3110 Operation

Please refer to the **3110 Help** files for operation and troubleshooting information for the 3110 Standards Waveform Generator. For help in getting up and running quickly on the 3110, please see the “3110 Tutorials” section in the **3110 Help** files.

3.2 Amplifier Module Operation

Your DSR system contains between one and four amplifier modules to provide the high-current output required for many Standards’ tests. If your system contains more than one amplifier module, those modules have been configured as a parallel multi-amp system, increasing the system’s output current capabilities.

In multi-amp configurations, the individual amplifier modules are interlocked together, with one Master amplifier controlling the operation of all of the amplifier modules in the system. With the exception of the breaker/power switches, a control operated on one amplifier module will perform that action on all of the amplifier modules in the system.

The following sections describe the controls and indicators found on the DSR Series amplifier modules.

3.2.1 Front-Panel Controls

This section provides an overview of Front-Panel controls found on the DSR amplifier modules.

Input Buttons

Three Push Buttons on the amplifier front panel control basic operation of the amplifier. See **Figure 3.1** for item locations.

Enable – For single amplifier systems, Enable will release the amplifier from Stop mode and place the amplifier in Run mode (both Ready and Run LEDs will be lit). When the amplifier is placed in Run mode, the high-voltage transformers will be energized and the amplifier will amplify the input signal.

For DSR systems with multiple amplifier modules, if the system has been placed in Standby mode, pressing the Enable button on the amplifier module that was used to place the system in Standby will release the system from Standby status and return all of the amplifier modules to Run mode. Note that the amplifier module controlling the Standby status will have the Standby and Stop LEDs lit, while all other modules will have the Ready and Standby LEDs lit. Pressing the Enable button on an amplifier module other than the module used to place the system in Standby mode will NOT return the system to Run mode. When the system is placed in Run mode, the high-voltage transformers will be energized and the system will amplify the input signal.

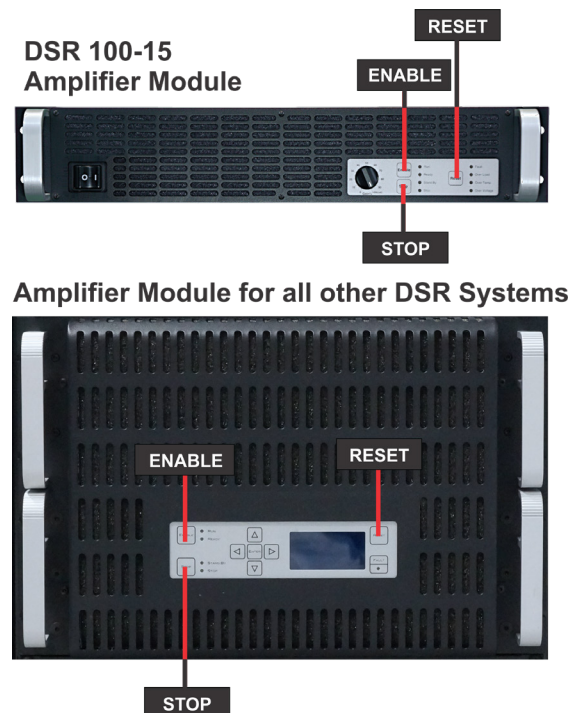


Figure 3.1 – Amplifier Module Input Buttons

Stop – For single amplifier systems, Stop will place the amplifier in Stop mode (both Standby and Stop LEDs will be lit). When an amplifier module is in Stop mode, the low-voltage transformer is energized but the high-voltage transformers are not.

For DSR systems with multiple amplifier modules, pressing the Stop button on any amplifier module in the system will place that module in Stop mode and all other amplifier modules in Standby mode. When an amplifier module is in Stop or Standby mode, the low-voltage transformer is energized but the high-voltage transformers are not.

Reset – For single amplifier systems, when a fault condition occurs, the amplifier module may be placed in Standby mode (Standby LED will be lit), depending on the fault condition. To release the amplifier from Standby mode, clear the fault condition and then press the Reset button. If the amplifier is in Run mode when the fault condition occurs, pressing the Reset button will return the amplifier to Run mode. If the amplifier is in Stop mode when the fault condition occurs, pressing the Reset button will return the amplifier to Stop mode.

For DSR systems with multiple amplifier modules, pressing the Reset button on the amplifier module reporting the fault condition will clear the condition and return all amplifiers modules to Run or Stop mode, depending on the status mode the system was in when the fault condition occurred. Pressing the Reset button on other amplifier modules in the system will NOT clear the fault condition.

Multi-Function LCD Display (all models except DSR 100-15)

See **Figure 3.2** for item location.

The multi-function LCD display provides peak and RMS values for voltage and current measured directly from the amplifier output. If the amplifier experiences a fault condition, the LCD display will automatically display details of the fault condition and prescribed corrective actions.

Amplifier Module for all DSR Systems except DSR 100-15

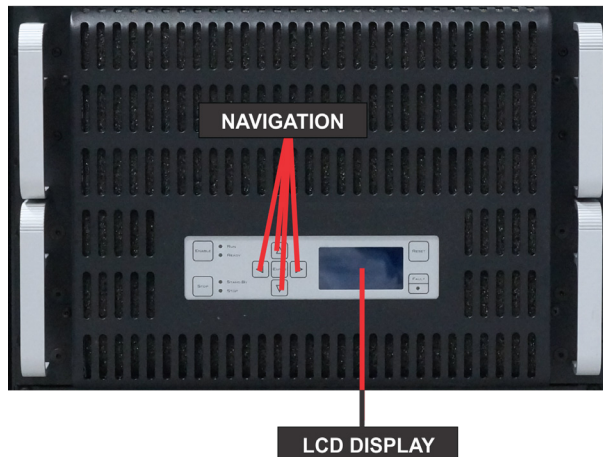


Figure 3.2 – Amplifier Module Multi-function LCD Display and Navigation Buttons

On startup, the LCD Display will provide readings for all four measurements: Volts peak, Volts RMS, Current peak, and Current RMS. Use the Navigation buttons to scroll to other available displays, such as peak voltage and current only, RMS voltage and current only, or other combinations.

Navigation Buttons (all models except DSR 100-15)

See **Figure 3.2** for item locations.

The Navigation buttons provide four arrow keys to allow navigation through the different voltage and current measurement functions on the LCD display screen.

NOTE: The Enter button has been provided for future expansion and has no function at this time.

3.2.2 Front-Panel Status Indicators

This section provides an overview of Front-Panel status indicators found on the DSR Series amplifier modules. Please refer to **Figure 3.3** for item locations.

Main Status Indicators

Four Main Status indicators are located on the amplifier module's front-panel. These LEDs monitor the internal conditions of the module and indicate the current state of operation. The chart in **Figure**

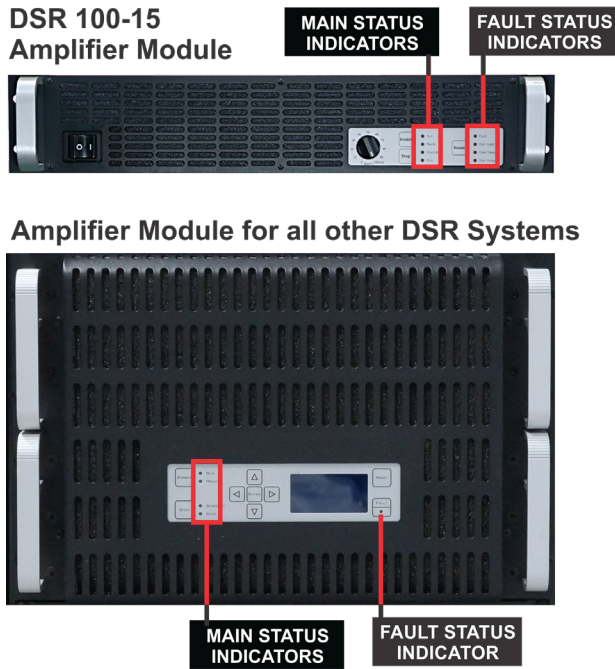


Figure 3.3 – Amplifier Module Status Indicators

3.4 details the operational modes indicated by the Main Status indicators.

In systems with multiple amplifier modules, the Main Status indicators on each module are used to determine the operational status of that module and are also evaluated along with the statuses of the other amplifier modules to determine the system status and the action required to return the system to a running condition. See **Figure 3.5**.

Fault Status Indicator

The Fault Status indicator is located on the amplifier module’s front panel. This LED monitors the internal conditions of the module and will illuminate when a fault condition occurs. Depending on the fault condition, the DSR100 system may be placed in Standby mode when a fault condition occurs. Refer to the chart in **Figure 3.6** to determine the fault condition being indicated and the action required to clear the fault condition.

Figure 3.4 – Main Status Indicators for Single Amplifier Systems

● ● ● Indicator is lit ● Indicator is not lit ○ Indicator may be lit

Main Status Indicators	State of Operation	Action Needed to Return to Run Mode
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>Run mode: The amplifier’s high-voltage transformers are energized and the unit will amplify the input signal. Run mode is initiated by: (1) the Enable push button when the amplifier is in Standby mode, or (2) when the amplifier powers up..</p>	N/A
<ul style="list-style-type: none"> ● Run ○ Ready ● Standby ● Stop 	<p>Standby mode: Standby mode indicates that the amplifier is functioning properly and all Fault Status modes are clear, but it is being held in Standby by an external condition. The amplifier will enter Standby mode briefly after powering up, and then will move automatically into Run mode. In Standby mode, the amplifier’s low-voltage transformer is energized but the high-voltage transformers are not.</p>	If the amplifier remains in Standby mode, and it is not part of a multi-amp system, the amplifier module may require servicing. Please contact AE Techron Technical Support.
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>Stop mode: When the Stop button on the amplifier front panel is pressed, the amplifier will enter Stop mode. In Stop mode, the amplifier’s low-voltage transformer is energized but the high-voltage transformers are not.</p>	To release the amplifier from Stop mode, press the Enable button.

Figure 3.5 – Main Status Indicators for Multi-Amplifier Systems

● ● ● Indicator is lit ● Indicator is not lit ○ Indicator may be lit

Main Status of One or More Amps in the System	Main Status of Other Amps in the System	State of Operation	Action Needed to Return to Run Mode
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>Run mode: All of the amplifiers in the system are in Run mode. The amplifiers' high-voltage transformers are energized and the system will amplify the input signal.</p>	N/A
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>System Not Ready: If one or more of the amplifiers has no LEDs lit, the amplifier has no power or has not been turned on, and the other amplifiers in the system will be held in Standby mode. In Standby mode, the amplifier's low-voltage transformer is energized but the high-voltage transformers are not.</p>	<p>Make sure all amplifiers have AC power and have been turned on. When all amplifiers attain Standby status, all amplifiers in the system will simultaneously be placed in Run mode.</p>
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>Stop mode: When the Stop button on any amplifier in the system is pressed, that amplifier will enter Stop mode and all other amplifiers will enter Standby mode. In Stop mode, the amplifier's low-voltage transformer is energized but the high-voltage transformers are not.</p>	<p>To release the system from Stop mode, press the Enable button on the amplifier displaying the Stop mode status.</p>

In systems with multiple amplifier modules, the Fault Status indicators on each module are used to determine the operational status of that module. When a fault condition occurs on any module in the system, the system may be placed in Standby mode. Typically, the system can be released from Standby mode by pressing the Reset button on the amplifier module displaying the Fault status. Refer to the chart in **Figure 3.7** to determine the fault condition being indicated and the action required to clear the fault condition and return the system to a running condition.

3.3 Using the 6-to-1 Attenuator Input

The Attenuator Amplifier Input sends the input signal through a 6:1 attenuator before sending to the system amplifiers. For every 6V received at the Attenuator connector, 1V will be sent to the system amplifier(s).

Most test sequences do not require the use of this attenuator. However, tests having a maximum voltage of less than 30V may require the use of the Amplifier Attenuator input.

The purpose of the attenuator is to DECREASE the overall system gain of the 3110 + amplifier from the typical setting of 20 to a setting that is 20/6 or approximately 3.33. Lowering the system gain allows the user to achieve maximum system signal-to-noise performance.

In general, if you are experiencing noise during testing, use of the attenuator is recommended.

3.3.1 System Calibration

When the Amplifier Attenuator input is used, System Gain must be recalibrated. This allows the 3110 to adjust its output levels to deliver the required levels at the system output.

Figure 3.6 – Fault Status Indicators for Single Amplifier Systems

● ● ● Indicator is lit ● Indicator is not lit ○ Indicator may be lit

Main Status Indicators	Fault Status Reported on LCD Display	State of Operation	Action Needed to Clear Fault Condition and Return to Run Mode
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	WARNING! OUTPUT DEVICE FAULT	Output Device Fault: This indicates that an Output Fault condition has occurred and the amplifier has been placed in Standby mode. The Fault indicator will light under two conditions: 1) High-frequency oscillation is causing high shoot-through current; or 2) An output transistor has shorted, causing the output fault condition.	This fault condition cannot be cleared using the front-panel Reset button. See the Troubleshooting section for more information on diagnosing and clearing this fault condition.
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	WARNING! OVERLOAD	Overload: This indicates that the output of the amplifier could not follow the input signal due to voltage or current limits.	To remedy the Overload fault, turn down the level of the input signal until the Fault indicator turns off.
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	WARNING! OVERTEMP	Overtemp: The amplifier monitors the temperature inside the high-voltage transformers, low-voltage transformer and in the output stage heat sinks. The Fault indicator will light and the amplifier will be placed in Standby mode when the temperature sensors detect a condition that would damage the amplifier. If the Overtemp pulse is extremely short, as in the case of defective wiring or switches, the Fault LED may be lit too briefly to observe.	To reset after an Over Temp fault has occurred, make sure the amplifier fans in all amplifiers are running, and then remove the input signal from the system. Allow the fans to run for about 5 minutes until the system automatically returns to Run mode. Please see the “Troubleshooting” section for information on correcting the cause of an Over Temp fault condition.
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	WARNING! OVERVOLTAGE	Overvoltage: This indicates that the AC mains voltage is more than +10% of nominal. The amplifier will be forced to Standby when an Overvoltage condition occurs. When the Overvoltage condition is cleared, the amplifier will automatically return to Run mode.	To clear an Overvoltage fault condition, the AC mains must be brought down to the nominal value. If the amplifier does not return to Run mode when the Overvoltage condition has cleared, the amplifier may require servicing. Please see the Troubleshooting section for more information.

To adjust the 3110’s System Gain setting complete the following steps:

1. Press the Settings button from the 3110’s main window, and then select the System Calibration tab.
2. If desired, adjust the 3110 Output Voltage from the default setting of 1 Vp.
3. Connect an oscilloscope to the DUT (load at the system output).
4. Press the Run Calibration Test button to run the Calibration Test.
5. When the System Calibration testing is completed, press the Save button to save the new System Gain setting and return to the 3110’s main menu.

Figure 3.7 – Fault Status Indicators for Multi-Amplifier Systems

● ● ● Indicator is lit ● Indicator is not lit ○ Indicator may be lit

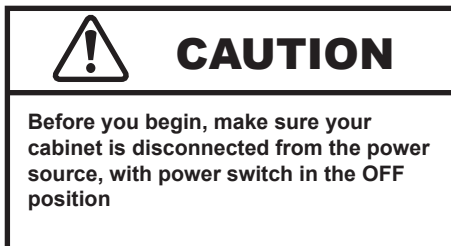
One or More Amps in System		Main Status Indicators of Other Amps in System	State of Operation	Action Needed to Clear Fault Condition and Return to Run Mode
Main Status Indicators	Fault Status Reported on LCD Display			
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>WARNING! OUTPUT DE- VICE FAULT</p>	<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>Output Device Fault status: This indicates that an Output Fault condition has occurred in the amplifier displaying the Fault status, and the system has been placed in Standby mode. The Fault indicator will light under two conditions: 1) High-frequency oscillation is causing high shoot-through current; or 2) An output transistor has shorted, causing the output fault condition.</p>	<p>This fault condition cannot be cleared using the front-panel Reset button. See the Troubleshooting section for more information on diagnosing and clearing this fault condition.</p>
<ul style="list-style-type: none"> ● Run ● Ready ○ Standby ● Stop 	<p>WARNING! OVERLOAD</p>	<ul style="list-style-type: none"> ● Run ○ Ready ○ Standby ● Stop 	<p>Overload status: This indicates that the output of the system could not follow the input signal due to voltage or current limits.</p>	<p>To remedy the Overload fault, turn down the level of the input signal until the Overload indicator turns off.</p>
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>WARNING! OVERTEMP</p>	<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>Overtemp status: Each amplifier in the system monitors the temperature inside the high-voltage transformers, low-voltage transformer and in the output stage heat sinks. The Overtemp indicator will light and the system will be placed in Standby mode when the temperature sensors detect a condition that would damage the amplifier system. If the Overtemp pulse is extremely short, as in the case of defective wiring or switches, the Fault LED may be lit too briefly to observe.</p>	<p>To reset after an Overtemp fault has occurred, make sure the amplifier fans in all amplifiers are running, and then remove the input signal from the system. Allow the fans to run for about 5 minutes until the system automatically returns to Run mode. Please see the Troubleshooting section for information on correcting the cause of an Overtemp fault condition.</p>
<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>WARNING! OVERVOLTAGE</p>	<ul style="list-style-type: none"> ● Run ● Ready ● Standby ● Stop 	<p>Overvoltage status: This indicates that the AC mains voltage is more than +10% of nominal. All amplifiers in the system will be forced to Standby when an Overvoltage condition occurs. When the Overvoltage condition is cleared, the system will automatically return to Run mode.</p>	<p>To clear an Overvoltage fault condition, the AC mains must be brought down to the nominal value. If the system does not return to Run mode when the Overvoltage condition has cleared, one or more amplifiers may require servicing. Please see the Troubleshooting section for more information.</p>

4 Maintenance

Simple maintenance can be performed by the user to help keep the equipment operational. The following routine maintenance is designed to prevent problems before they occur. See the “Troubleshooting” section for recommendations for restoring the equipment to operation after an error condition has occurred.

Preventative maintenance is recommended after the first 250 hours of operation, and every three months or 250 hours thereafter. If the equipment environment is dirty or dusty, preventative maintenance should be performed more frequently.

The procedures outlined in this section are directed towards an experienced electronics technician; it assumes that the technician has knowledge of typical electronics safety and maintenance procedures.



4.1 Clean Amplifier Filter and Grills

4.1.1 Tools Required

The recommended equipment and supplies needed to perform the functions required for this task are described below.

- Torx T15 driver
- Vacuum cleaner
- Damp cloth (use water only or a mild soap diluted in water)

To ensure adequate cooling and maximum efficiency of the internal cooling fans, the amplifier module’s front and rear grills should be cleaned periodically. To clean the amplifier grills and filter, complete the following steps:

1. Turn the cabinet OFF. Disconnect the cabinet from its power source.
2. Remove the four Torx-head screws, located along the left and right edges of the front panel of each amplifier module using a Torx T15 driver. Retain.
3. Remove the amplifier modules’ front covers by pulling straight towards you.
4. Using a vacuum cleaner, vacuum the front and rear ventilation grills. Vacuum the filters behind the front ventilation grill.
5. Using a damp cloth, clean the front and rear ventilation grills. Dry with a clean cloth or allow to air dry. **IMPORTANT: Grills should be completely dry before plugging in or restarting the system.**
6. Reinstall amplifier modules’ front filters and ventilation grills. Secure the front grills using the retained screws

4.2 Clean Cabinet Interior

4.2.1 Tools Required

The recommended equipment and supplies needed to perform the functions required for this task are described below.

- Vacuum cleaner
1. Using a vacuum cleaner, remove any dust that has accumulated within the cabinet interior.
 2. Close the cabinet rear door and restart the test system. Check for any problems such as inoperative fans that might cause overheating.

5 Troubleshooting

If the DSR system is not operating correctly, review the topics below for help with troubleshooting the problem. If the condition or error you are experiencing is not listed below, please contact **AE Techron Technical Support** at 574-295-9495 for additional help.

PROBLEM: The system has no signal output.

A: Check to make sure signal input is being generated using the 3110 Standards Waveform Generator or a stand-alone signal generator. Check the BNC cable connecting from the 3110 Signal Out BNC connector to the DSR system Signal Input BNC connector. See the section “System Setup” in this manual for more information.

Within the 3110 SWG software, check to make sure that output is enabled for the test sequence and that the “Segment Enabled” option is selected for all wave segments.

PROBLEM: Cabinet does not power on; no LEDs are lit on the 3110 and all of the amplifier modules.

A: Check that the AC mains are connected to the cabinet and the AC mains is switched on.

PROBLEM: 3110 unit does not power on.

A: Check the front-panel power switch to make sure the unit is in the ON position.

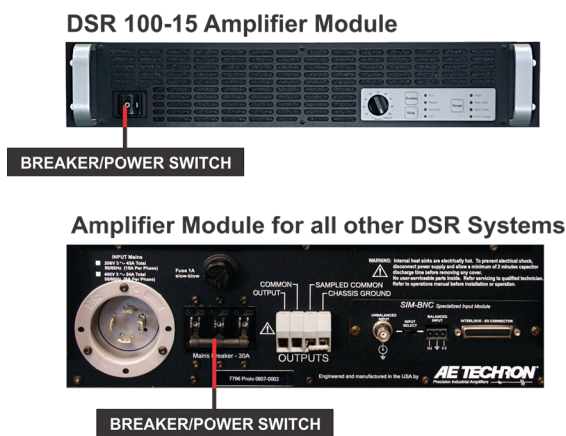


Figure 5.1 – Amplifier Module’s Breaker/Power Switch Location

PROBLEM: Experiencing noise during testing.

A: Use the Amplifier Input labeled “Attenuator” on the DSR system’s front I/O panel. Adjust the system gain as instructed to improve the system’s signal-to-noise performance. See the topic “Using the 6-to-1 Attenuator Input” in the “Operation” section of this manual for information.

PROBLEM: The SWG Windows Remote software will not load or will not connect remotely to the 3110; instead, an error message indicates a “version mismatch.”

A: The 3110 software and the Windows Remote software versions must match for successful interaction between the two modules. See the topic “Updating the 3110” in the **3110 Help** files for information about how to install new versions of these modules.

PROBLEM: On one or more of the amplifier modules, no LEDs are lit and/or fans are inoperative.

A: Check the breaker/power switches on all amplifier modules to make sure they are in the on position. See **Figure 5.1**.

Check the fuse F1 on each amplifier module. Locate the fuse cover on the amplifier back panel and turn the cover counter-clockwise to remove. Remove the fuse, inspect, and replace if needed with 1A slow blow fuse. See **Figure 5.2**

PROBLEM: One or more of the amplifier modules is displaying the Overvoltage Warning message/LED.



Figure 5.2 – Amplifier Module’s Low-voltage Fuse Location

A: The amplifier modules will protect themselves from AC mains voltage that is 10% above the 230V rated operating voltage. If this condition occurs, reduce the AC mains voltage to the proper level. When the line voltage condition is corrected, the amplifier modules will automatically reset, and the system will return to Run mode.

If one or more amplifier modules do not automatically reset, the amplifier's three internal transformers may need to be rewired. See the Factory Service information at the end of this section.

PROBLEM: One or more of the amplifier modules is displaying the Overtemp Warning message/LED.

A: One or more amplifier modules may overheat due to one or both of the following conditions: Excessive power requirements and/or inadequate air flow.

An amplifier module will overheat if the required power exceeds the system's capabilities. High duty cycles and low-impedance loads are especially prone to cause overheating. To see if excess power requirements are causing overheating, check the following:

1. Check the "Specifications" section in this manual to verify that your application's requirements fall within the capabilities of this system.
2. Check for faulty output connectors and/or load.
3. Check for undesired DC offset at the output and on the input signal.

If one or more amplifier modules chronically overheats with suitable power and load conditions, then the cabinet or amplifier may not be receiving adequate airflow. Check the following to determine the cause of inadequate airflow:

1. Check air filters for excess dirt and dust. Perform the steps outlined in the "Maintenance" section to clean the amplifier filters and cabinet.
2. Visually inspect fans to assure correct operation while the system is on. Any inoperative, visibly slow, or reverse-spinning fans should be replaced. Please see the Factory Service

information at the end of this section.

An OverTemp condition places the unit in Standby mode. If the OverTemp pulse is extremely short, as in the case of defective wiring or switches, the OverTemp pulse may be too brief to observe.


Resetting After Overtemp: To reset the system after an OverTemp has occurred, make sure fans are running in all the amplifier modules, then remove the input signal from the system input. Allow the fans to run for five minutes, and then push the Reset button on the amplifier module(s) reporting the Overtemp Warning to reset the system.

PROBLEM: One or more of the amplifier modules is displaying the Output Device Fault Warning message/LED.

A: The amplifier modules contain protection circuitry that disables the module if an output stage is behaving abnormally. This usually indicates an output transistor has shorted.

To clear the Fault condition, follow these steps:

1. Turn off the signal source.
2. Turn off the system AC mains.
3. Turn AC mains power back on. If the Fault LED doesn't illuminate again, turn the signal source on.
4. If the Fault LED is still illuminated and the Fault condition doesn't clear, return the amplifier module for Factory Service. Please see the Factory Service information at the end of this section.

	CAUTION
<p>Shut off the signal source before resetting the system. Try resetting the Fault condition only once. If the Fault condition on any amplifier module does not clear after one reset, STOP. Contact AE Techron Support for further assistance. Repeated resetting can damage the amplifier module.</p>	

5.1 Factory Service:

If the troubleshooting procedures are unsuccessful, the DSR system may need to be returned for Factory Service. All units under warranty will be serviced free of charge (customer is responsible for one-way shipping charges as well as any custom fees, duties, and/or taxes). Please review the “Warranty.” for more information.

All service units must be given Return Authorization Tickets by AE Techron, Inc. before being returned. Return Authorization Tickets can be requested on our website or by contacting our Customer Service Department.

Please take extra care when packaging your unit for repair. It should be returned in its original packaging or a suitable alternative. Replacement packaging materials can be purchased for a nominal fee.

Please send all service units to the following address and be sure to include your Return Authorization Ticket Number on the box.

AE Techron, Inc.
Attn: Service Department / RMA#
2507 Warren Street
Elkhart, IN 46516