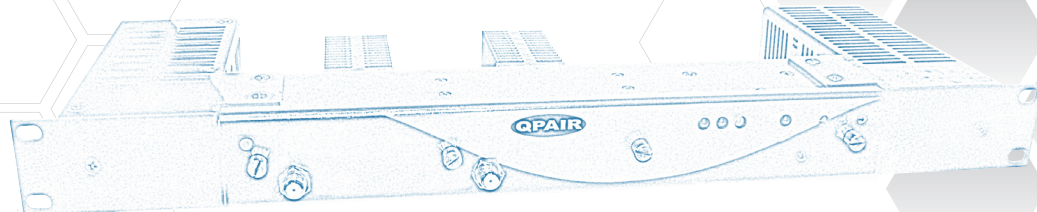




Q-SERIES® Amplifiers

QPAIR Redundancy Switch Amplifier System

Installation & Operation Manual



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DESCRIPTION OF INTERFACES

1. Description of Interfaces



QPAIR Redundant Amplifier System Front View



QPAIR Redundant Amplifier System Rear View

The QPAIR system (the system) has five sections: two modular amplifier sections, the RF switch section and two replaceable power supplies.

Replaceable Power Supplies: (one located at each end of the chassis)

AC Input (100-240 VAC, 50 or 60 Hz) or -48 VDC input.

The system can also be ordered with (1) AC input and (1) 48 VDC input for source redundancy.

The power supply configuration depends on user specification at time of ordering.

Description: Both of the power supplies are connected at the same time via their designated terminals. In normal operation, the power supplies are in redundant mode with no switching required. Power supply 1 and power supply 2 each have a green LED (PWR 1 and PWR 2) on the front to indicate normal power supply operation. The PWR Failure red LED (see Figure 1) on the front also indicates power supply status. If the PWR Failure LED is solid red, then that indicates the PWR1 supply is not operational and if the LED is blinking, then that indicates the PWR 2 supply is not operational. This may also be noted during the installation when only one power supply is initially plugged into source voltage. The PWR Failure LED will either be solid or blink depending on which power supply is connected to source power first. The PWR Failure LED will remain lit after any PS failure or source power failure. Failure is also detected upon unplugging either power supply from the power source. Anytime the PWR failure LED is lit and voltage has been restored, or immediately after installation, the RESET button must be pushed to activate normal operation.

RF Amplifier Connections: (Rear View)

- a) **Rear of Chassis:** this section only describes the amplifier connections, not the switch connections.

Input to AMP 1 (labeled RF IN and located immediately at the lower left of the left heat sink).

Output from AMP 1 (labeled RF OUT and located at the upper right of the left heat sink).

Input to AMP 2 (labeled RF IN and located immediately at the lower left of the right heat sink).

Output from AMP 2 (labeled RF OUT and located at the upper right of the right heat sink).

- b) **Front of Chassis:** (with cover removed):

RF test point (-20 dB) located at left front of each amplifier module and labeled "AMP1 OUTPUT TP" on AMP 1 and "AMP2 OUTPUT TP" on AMP 2. A Pad socket for input level and pad socket for output level adjustment is located in each amplifier compartment. The equalizer socket for input level and equalizer socket for output level adjustment are also located in each amplifier compartment.

Description: The primary and the secondary amplifier are identical. However, this system designates AMP 1 as the *primary amplifier* and AMP 2 is designated as the *secondary amplifier*. When we discuss the term *primary amplifier*, we are discussing AMP 1 and when we use the term *secondary amplifier*, we are discussing AMP 2. The primary amplifier is located approximately at the middle of the chassis and the secondary amplifier is located toward the left side of the chassis from a front view. Each

amplifier has its input at the right lower side of its amplifier board (see Figure 2). The signal flows up to the adjacent input pad, then left to the adjacent input equalizer, then back down to the hybrid module. From the output (left) side of the hybrid module, the signal flows up to the output pad socket, left to the adjacent output equalizer, through the output test point coupler and up to the output located at the upper left portion of the board.

RF Switch: (Rear View)

Connections:

RF INPUT (located to the right of the alarm terminal block on the left side of the chassis from a back view). This is the main RF input for the QPAIR system.

TO AMP 1 - the primary signal level comes out at this port for connection to the input of the primary amplifier (AMP1). This signal is from the RF Input port via internal routing/splitting circuitry.

TO AMP 2 - the secondary signal level comes out at this port for connection to the input of the secondary amplifier (AMP2). This signal is also from the RF Input port via internal routing/splitting circuitry. During normal operation, the AMP 2 input signal level is approximately 25 dB lower than the signal level feeding the primary amplifier.

FROM AMP 1 - Connect the output of the primary amplifier (AMP1) to this port.

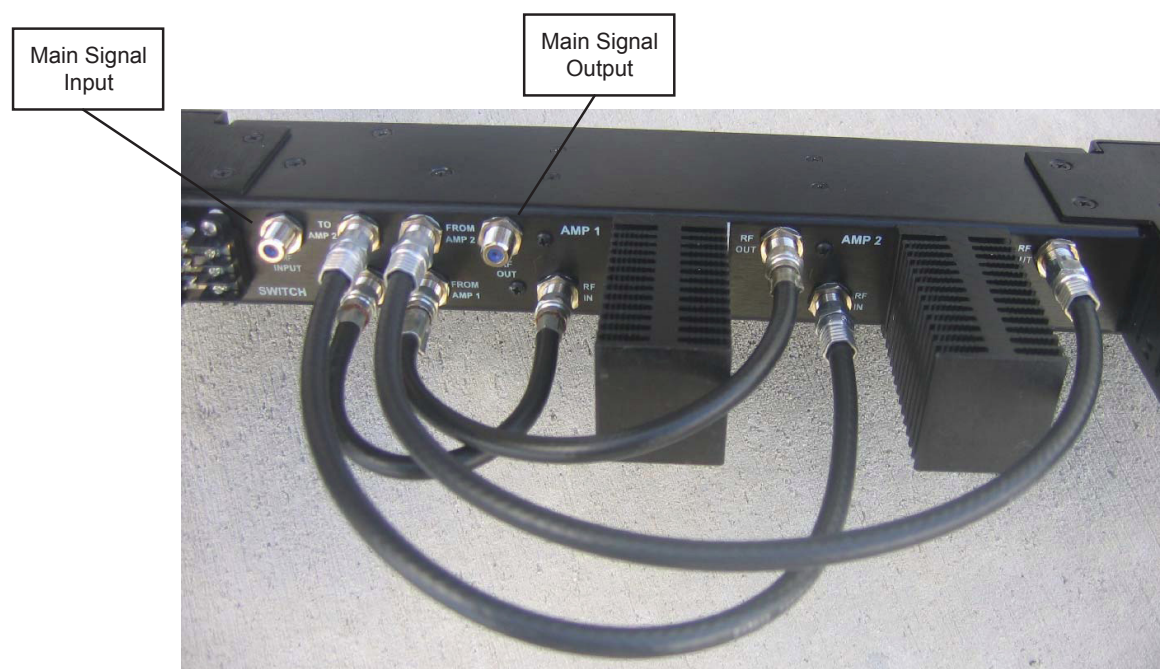
FROM AMP 2 - Connect the output of the secondary amplifier (AMP2) to this port.

RF OUT- (on left side of chassis and on the right side of the port labeled FROM AMP 2. This is the main output of the QPAIR system.

Installation Description:

1. If you are replacing an existing amplifier, then move the input from your existing amplifier to the main signal input connector that is labeled RF INPUT.
2. Connect a cable from the TO AMP 1 connector to the primary amplifier input labeled RF IN on the lower left of the left heat sink.
3. Also, connect a cable from the TO AMP 2 connector to the secondary amplifier input labeled RF IN on the lower left of the right heat sink.
4. Connect a cable from the primary amplifier output labeled RF OUT and which is located at the upper right side of the left heat sink to the port labeled FROM AMP 1.
5. Connect a cable from the secondary amplifier output labeled RF OUT and which is located at the upper right side of the right heat sink to the port labeled FROM AMP 2.
6. Move the output cable from your existing amplifier to the port labeled RF OUT on the switch and which is located to the right of the port labeled FROM AMP 2.

Please refer to the following picture for illustration.



Alarms:a) **Rear of Chassis:**

Form C contacts: C for common, NO for normally open, NC for normally closed.

Description: A contact closure from the NO connection to the C connection is present when the unit is in operation and under power. When any failure occurs the contacts will switch to a closure between the NC connection and the C connection. A failure is defined as an RF change that causes a switch to be made, or any device failure, including either power supply or either RF amplifier.

b) **Front of Chassis:** (refer to Figure 1 for this section)

Green LED: 5V power on

Yellow LED (warning):

- On continuous: using reference levels stored in EEPROM
- Flashing (1/sec) slow: needs to set reference levels. Normal on power-up or reset.
- Flashing (3/sec) fast: switched to the secondary amplifier when pushing and holding the FORCED SW button.

Red LED (Failure):

- On continuous: primary amp failure. Signal has been switched to the secondary amplifier by the system.
- Flashing (1/sec) slow: secondary amp failure
- Flashing (3/sec) fast: input signal low or primary amp and secondary amp failure.

Red LED (PWR Failure)

- On continuous: power supply 1 failure
- Flashing (1/sec) slow: power supply 2 failure

RF Detector Test Point: (hidden behind the front cover between the PWR failure LED and the Set Ref. button)

- AMP1 RF Level Detector: DC level proportional to the primary amp RF output level.
- AMP2 RF Level Detector: DC level proportional to the secondary amp RF output level.

Recessed Push-Button Switches:

- Reset: restarts the microcontroller program
- Set Ref: stores the levels as references and start monitoring amplifiers and power supplies.
- Forced SW: forces a switch to the secondary amplifier. Facilitates set-up of RF levels.

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DESCRIPTION OF OPERATION

2. Description of Operation

(Refer to Figure 2 and Figure 6 for location of switches, push buttons, and LEDs)

RF output levels of both the primary and the secondary amplifiers are sampled and this sample is converted to a voltage value. At initial power on or when the reset button is pushed, the system is switched to run on the primary amp (AMP 1). The yellow LED will flash slowly indicating the reference levels need to be set. By pressing the SET REF button, the microcontroller samples the output values of both the primary amp and the secondary amp and stores the values as references. These values will be used to compare with the sampled output values of both amplifiers to confirm proper levels. At any time during the operation, one can always press RESET to reset the microcontroller program. Then push SET REF to store the new sampled values.

During normal operation, if both outputs are within 3 dB (factory programmable) of the reference values, no action will be taken. If the primary amp is down 3 dB or more and the secondary amp is not, the system considers the primary amp failed and will switch to the secondary amp, set the alarm, and set the red failure LED on. The microcontroller cannot perform any additional switches because the detectors are unable to sample the signal when the secondary amplifier is activated (see Figure 6). You will need to troubleshoot or replace the primary amplifier. See Appendix 3 for troubleshooting instructions or Appendix 2 for replacing the amplifier module. After the amplifier problem is resolved, you need to reset the system by pushing the RESET button. Set the levels according to the setup procedure and store levels by pushing the SET REF button.

If both outputs are down 3 dB or more, the system considers the input is low and will set the red LED flashing quickly and set the alarm. After resolving the low input level problem, set the system output levels according to the setup procedure. To restore normal operation push the RESET button and then push the SET REF button.

If the system is running on the primary amp and the secondary amp level is down 3 dB or more, the system considers the secondary amp failed and will set the alarm and set the red LED flashing slowly. You need to troubleshoot or replace the secondary amplifier. See Appendix 3 for troubleshooting instructions or Appendix 2 for replacing the amplifier module. After the amplifier problem is resolved, you need to reset the system by pushing the RESET button. Set the levels according to the setup procedure and store levels by pushing the SET REF button.

The signal level within the bandwidth of the primary amplifier coming into the RF switch compartment should be limited to not more than 50 dBmV per channel. However, if only part of the TV channel spectrum is used, the maximum signal level per channel may be higher than 50 dBmV and the minimum signal level should be higher than 20 dBmV. If needed, contact ATX Networks for assistance in calculating the correct levels.

The recommended primary or secondary amplifier output level is between 20 dBmV and 50 dBmV with all the TV channels loaded within the passband. The secondary amplifier operates 25 dB lower than the primary amplifier during normal operation and is switched to full output level when a switch to the secondary amplifier is made. The reduced level of the secondary amplifier during normal operation adds to the isolation between the outputs of the two amplifiers.

The system stores the reference levels to the non-volatile EEPROM memory in the microcontroller. When a power outage occurs and power is restored, the QPAIR will wait for three minutes for the user to press the SET REF button. If the user does not press the SET REF button within 3 minutes, the microcontroller will retrieve the stored reference levels from memory. The system will also warn the user with a steady yellow LED light when it's using the retrieved reference levels after a power interruption. To clear the yellow warning light, we recommend you reconfirm the output RF levels by using the setup procedure.

During normal operation the alarm contacts are energized (i.e. the Normally Open contact is connected to the Common contact). This configuration ensures that the user be alerted when power goes down.

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SET-UP PROCEDURE

3. Set-up Procedure

1. Remove the front cover. See Appendix 1 for the proper method to remove the front cover.
 2. Connect main input cable to the RF INPUT on the left rear part of the chassis.
 3. Connect a cable from the TO AMP 1 port to RF IN of AMP 1 on the rear of the chassis.
 4. Connect a cable from the TO AMP 2 port to RF IN of AMP 2 on the rear of the chassis.
 5. Connect a cable from the FROM AMP 1 port to RF OUT of AMP 1 on the rear of the chassis.
 6. Connect a cable from the FROM AMP 2 port to RF OUT of AMP 2 on the rear of the chassis.
 7. Connect your main output cable to the RF OUT port on the rear of the chassis.
 8. Connect the source power cables (AC or –48) to the 2 power supplies.
 9. Push the RESET button.
 10. Connect signal strength meter to the OUTPUT TEST POINT of AMP 1 on the front of the chassis.
 11. Insert/Change the proper pad and equalizer so the output levels of the amplifier (AMP 1) are correct.
 12. Push the SET REF button.
 13. Connect signal strength meter to the OUTPUT TEST POINT of AMP 2 on the front of the chassis.
 14. Push and hold the FORCED SW button to force a switch to the secondary amplifier (AMP 2).
 15. Insert/Change the proper pad and equalizer so the output levels of the amplifier (AMP 2) are correct.
 16. Release the FORCED SW button.
 17. The next step is to check the DC voltages on each detector test point (see Figure 1). The detector test points are metallic tabs with a hole in the center and are located on the top board of the switch between the PWR failure LED and the SET REF button. **DC voltages on Test Point 1 and Test Point 2 should be above 0.65 Volts and below 2 Volts for proper operation.**
 18. Put the cover back on. See Appendix 1.
 19. Press the RESET button.
 20. Press the SET REF button.
- SET UP PROCEDURE IS COMPLETE

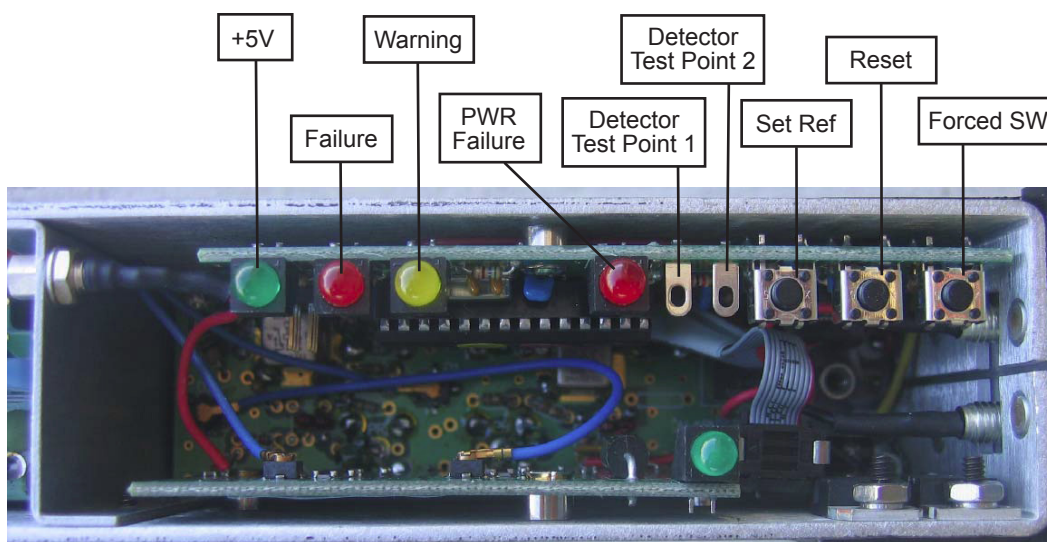


Figure #1 - QPAIR Switch/Controller Module Details

APPENDIX

APPENDIX 1: Method of Removing the Front Cover

The front cover is held in place by captive thumbscrews. A partially threaded hollow tube guides the screws on the back of the cover. When removing, the screws need to be turned counterclockwise until they feel loose from the fastener located in the bottom of the amplifier/switch sections. Then CONTINUE to turn the screw counterclockwise a few more turns to hold it in place in the threaded hollow tube. This keeps the screws from moving loosely around and possibly shorting out the circuits when re-installing the lid. The lid may now be removed by pulling on the two outer screws simultaneously. When re-installing the lid, just reverse the procedure for removing the lid. After the lid is in the proper position to re-install, then the screws can be turned clockwise into the fastener. This procedure will prevent damage to the amplifier or switch.

APPENDIX 2: Procedure for Removing/Replacing a Modular Amplifier (refer to Figure 2)

First, unplug the red power wire from the module you are removing. This power wire is located at the upper edge of the module and is plugged onto the board by a socket. Pull straight up away from the board and the power wire will come loose from the connection. Next, remove all equalizers and pads to make it easier to work with the thumbscrews. Loosen the 2 knurled thumbscrews with slotted screwdriver by turning counterclockwise until the screw is free of the threaded heat sink. Continue turning the thumbscrews to until the screw is held stable by the threads on the standoff of the circuit board. These screws are located in the center of the board. Do not remove the Phillips screws that hold the hybrid module in place. Only loosen the 2 knurled thumbscrews in the horizontal centerline of the board. Now, you should be able to pull up on the screws to free the board from the push-on connectors. You will then need to tilt the board as you remove it so as to clear the power feed-thru connections. DO NOT TRY TO OPERATE THE MODULE OUT OF THE CHASSIS BECAUSE IT REQUIRES THE SINK TO DISSIPATE THE HEAT. To replace the board, just reverse the procedure. However, be sure to use a small amount of heat sink compound on the amplifier plate where it mates up to the heat sink.

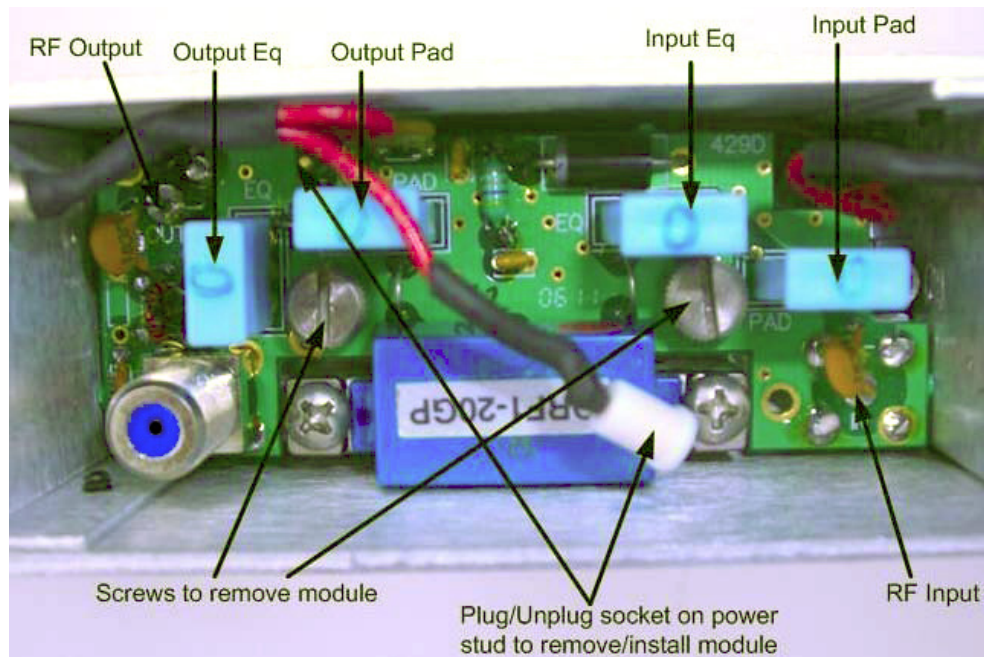


Figure #2 - QPAIR RF Amplifier Module

APPENDIX 3: Amplifier Troubleshooting Suggestions

To troubleshoot RF level problems with either amplifier, it is best to have normal input signal levels to the amplifier module. For example, if the secondary amplifier (AMP 2) is in service, then the primary amplifier is switched with no RF input/output. A quick method to check amplifier level issues is to disconnect the RF IN and RF OUT cables from AMP 1 on the back of the chassis (in this scenario). You could now use another signal source from some other part of the headend to put standard signal levels into the RF IN port. Now use a signal level instrument to measure the output level on RF OUT. If the amplifier gain is lower than the gain in the specification sheet, you will need to remove the amplifier module and contact QRF for a repair/replacement module. DO NOT TRY TO OPERATE THE MODULE OUT OF THE CHASSIS BECAUSE IT REQUIRES THE SINK TO DISSIPATE THE HEAT. If the primary amplifier (AMP 1) is in service, the secondary amplifier is switched so that the input level is 25 dB lower than normal. You may disconnect the RF IN cable and the RF OUT cable from AMP

2 (secondary amplifier) on the back of the chassis and complete the troubleshooting methods as described above for AMP 1.

APPENDIX 4: Removal/Replacement of Power Supply (See next page for Figures 3 & 4)

If you need to remove and replace either of the power supplies, you will need to remove 5 screws and unplug 2 wires connecting the power supply to the chassis. Two screws are located on the top and 2 screws are located on the bottom and one screw is located on the front of the power supply. The screws on the top and bottom are located on the tab of the power supply enclosure where it fastens to the chassis. The front screw goes through the front plate of the QPAIR. Just remove these 5 screws and then hold the power supply as you locate the 2 wires connecting to the chassis. Just unplug the wires from their sockets and the power supply removal is complete. To replace a power supply, just reverse the above procedure. Observe the positive and negative polarity of the wires and feed-thru “studs” when you plug the sockets onto the “studs”.

Figures 3, 4, & 5 will assist in removing/replacing power supply.

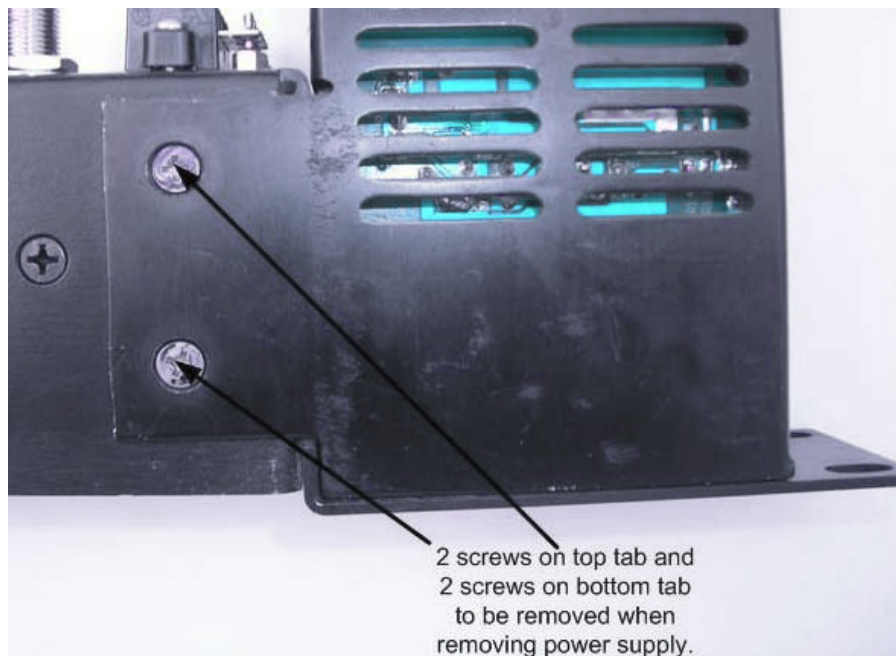


Figure #3 - Screws on Tabs Securing Power Supply

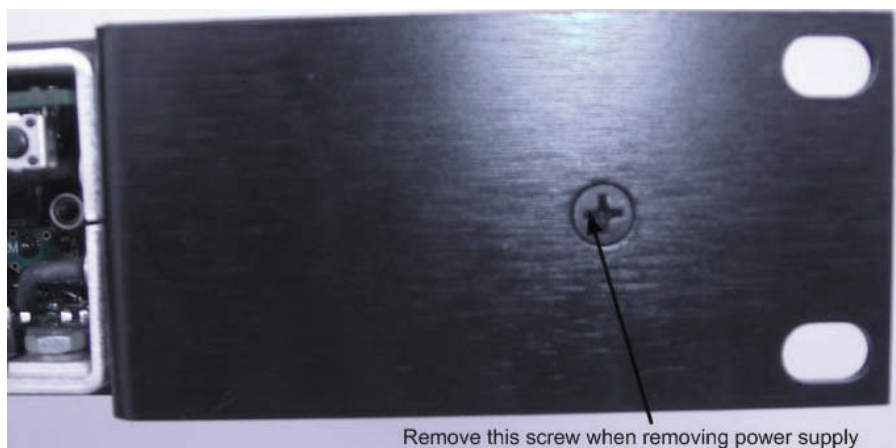


Figure #4 - One Screw on Front Securing Power Supply

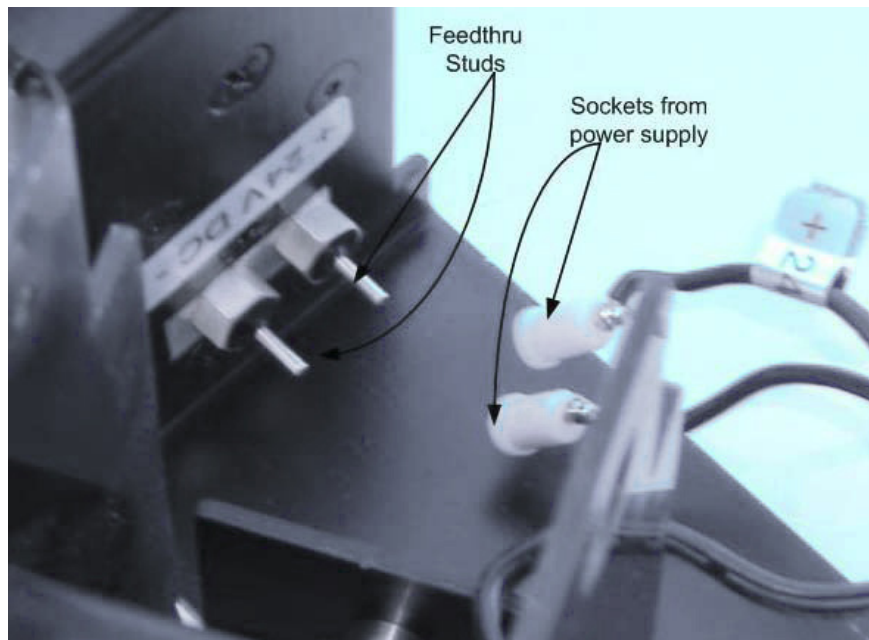


Figure #5 - Sockets and Studs on Power Supply Connection

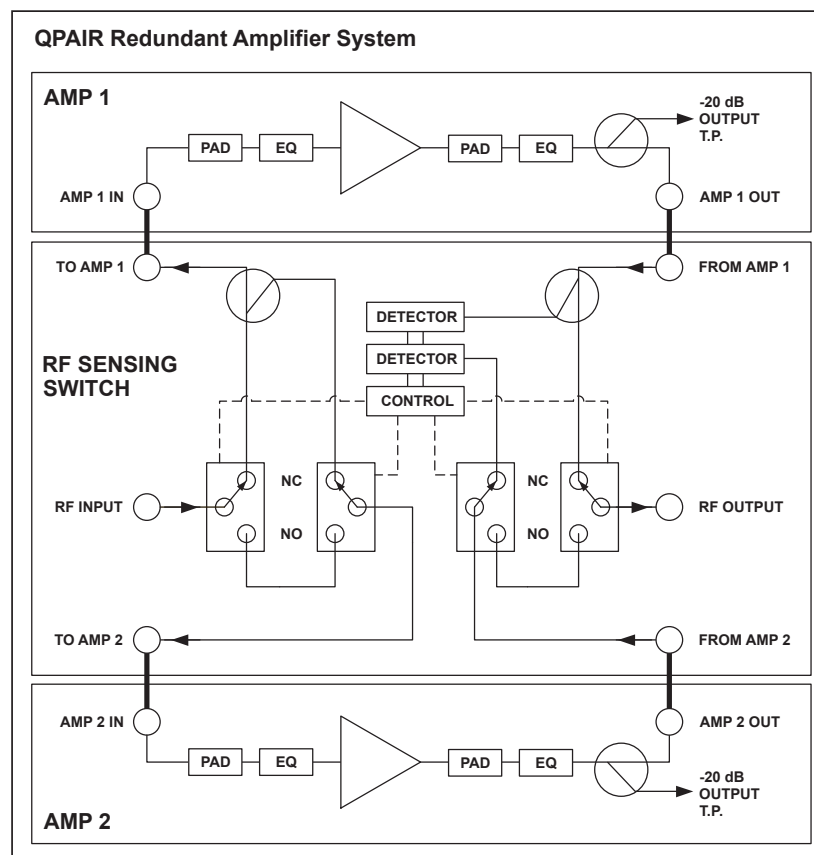


Figure #6 - QPAIR Block Diagram

SPECIFICATIONS

4. Specifications

4.1 Amplifier Specifications

PART NUMBER ⁽¹⁾	GAIN				GAIN/SLOPE CONT.		OUTPUT T.P.	I/O	CURRENT ⁽⁵⁾ (mA)	DISTORTIONS ⁽³⁾⁽⁴⁾					NOISE FIGURE		AMP TECH ⁽⁶⁾
	BW (MHz)	Gain ⁽²⁾ (dB)	Slope (dB)	Flat. (±dB)	Gain	Slope				Level (dBmV)	Slope (dB)	CTB (-dB)	CSO (-dB)	(dB)			
					Plug-in		(dB)										
QPAIR870-13G/*	40-870	13	-1/+ .5	.35	Pad	EQ	20 +/- 1	16	260	40	0	78	75	3.8	PP GaAs		
QPAIR870-17G/*	40-870	17	-1/+ .5	.35	Pad	EQ	20 +/- 1	16	260	40	0	78.2	75.1	4	PP GaAs		
QPAIR870-19GP/*	40-870	19	-1/+ .5	.35	Pad	EQ	20 +/- 1	16	375	40	0	77	73	5	GaAs PD		
QPAIR870-23GP/*	40-870	23	-1/+ .5	.5	Pad	EQ	20 +/- 1	16	375	40	0	77	73	4	GaAs PD		
QPAIR1000-13G/*	40-1000	13	-1/+1.5	.5	Pad	EQ	20 +/- 1	16	260	40	0	78	75	3.8	PP GaAs		
QPAIR1000-17G/*	40-1000	17	-1/+1.5	.5	Pad	EQ	20 +/- 1	16	260	40	0	78	75	4	PP GaAs		
QPAIR1000-19GP/*	40-1000	19	-1/+1.5	.5	Pad	EQ	20 +/- 1	16	375	40	0	77	73	5	GaAs PD		
QPAIR1000-23GP/*	40-1000	23	-1/+1.5	.75	Pad	EQ	20 +/- 1	16	375	40	0	77	73	4	GaAs PD		
QPAIR870-19GPH/*	40-870	19	-1/+1.5	.5	Pad	EQ	20 +/- 1	16	440	40	0	82	77	5	GaAs PDH		
QPAIR1000-19GPH/*	40-1000	19	-1/+1.5	.5	Pad	EQ	20 +/- 1	16	440	40	0	81	75	5	GaAs PDH		
QPAIR1000-23GPH/*	40-1000	23	-1/+1.5	.75	Pad	EQ	20 +/- 1	16	440	40	0	81	75	4	GaAs PDH		

NOTES:

(1) /* = Denotes the type of power supply: AC, 48, or AC/48

(2) Gain specified at highest frequency.

(3) Distortions measured with 50-550 MHz analog CW (6 MHz spacing) and 550-1000 MHz noise at -6 dBc (average power per 6 MHz).

(4) Specified with 0 dB plug-in attenuators and 0 dB plug-in EQs.

(5) DC load current at +24 VDC per module.

(6) PP = Push-Pull; PD = Power-Doubled; GaAs = Gallium Arsenide; PDH = Power-Doubled High-Current

Operating temperature: 0°C to +50°C (+32°F to +122°F)

Humidity: 20-55% (without condensation)

Dimensions: 1.75"H x 19.0"W x 5.0"D (4.45H x 48.26W x 12.7D cm)

Weight: 4.6 lbs (2.1 kg)

4.2 Switch Specifications

SPECIFICATIONS	
SWITCHING TIME	100ms default delay - contact ATX for different delay times
ISOLATION	55 dB from 40-550 MHz; 50 dB from 550-1000 MHz
INSERTION LOSS	2 dB (1 dB on the input and 1 dB on the output)
RETURN LOSS	18 dB (min)
RF SENSITIVITY RANGE	+20 dBmV to +50 dBmV amplifier output monitoring
POWER DISSIPATION	6.3 watts normal mode, 8.5 watts in backup mode

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SERVICE & SUPPORT

5. Service & Support

5.1 Contact ATX Networks

Please contact ATX Technical Support for assistance with any ATX products. Please contact ATX Customer Service to obtain a valid RMA number for any ATX products that require service and are in or out-of-warranty before returning a failed module to the factory.

TECHNICAL SUPPORT

Tel: (905) 428-6068

Toll Free: (800) 565-7488 (USA & Canada only)

► Press *3 for **Technical Support**

► Then press 1 for **Digital Video Products (DVIS, DigiVu, UCrypt, etc.)**

► OR, press 2 for **All Other Products**

Email: digitalvideosupport@atxnetworks.com for **Digital Video Products**

Email: jleskovar@atxnetworks.com for **All Other Products**

CUSTOMER SERVICE

ATX Networks

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Ajax, ON L1S 7H4 Canada

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Toll Free: (800) 565-7488 (USA & Canada only)

► Press *1 for **Customer Service**

Fax: (905) 427-1964

Toll Free Fax: (866) 427-1964 (USA & Canada only)

Web: www.atxnetworks.com

Email: support@atxnetworks.com

5.2 Warranty Information

All of ATX Networks' products have a 1-year warranty that covers manufacturer's defects or failures.



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