

DFR22

Audio Processor with Feedback Reduction

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! IMPORTANT SAFETY INSTRUCTIONS !

1. READ these instructions.
2. KEEP these instructions.
3. HEED all warnings.
4. FOLLOW all instructions.
5. DO NOT use this apparatus near water.
6. CLEAN ONLY with dry cloth.
7. DO NOT block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. DO NOT install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. DO NOT defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wider blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. PROTECT the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. ONLY USE attachments/accessories specified by the manufacturer.
12.  USE only with a cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. UNPLUG this apparatus during lightning storms or when unused for long periods of time.
14. REFER all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. DO NOT expose the apparatus to dripping and splashing. DO NOT put objects filled with liquids, such as vases, on the apparatus.
16. The MAINS plug or an appliance coupler shall remain readily operable.
17. The airborne noise of the apparatus does not exceed 70dB (A).
18. Apparatus with CLASS I construction shall be connected to a MAINS socket outlet with a protective earthing connection.
19. To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
20. Do not attempt to modify this product. Doing so could result in personal injury and/or product failure.



This symbol indicates that there are important operating and maintenance instructions in the literature accompanying this unit.



This symbol indicates that dangerous voltage constituting a risk of electric shock is present within this unit.

WARNING: Voltages in this equipment are hazardous to life. No user-serviceable parts inside. Refer all servicing to qualified service personnel. The safety certifications do not apply when the operating voltage is changed from the factory setting.

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

! CONSIGNES DE SÉCURITÉ IMPORTANTES !

1. LIRE ces consignes.
2. CONSERVER ces consignes.
3. OBSERVER tous les avertissements.
4. SUIVRE toutes les consignes.
5. NE PAS utiliser cet appareil à proximité de l'eau.
6. NETTOYER UNIQUEMENT avec un chiffon sec.
7. NE PAS obstruer les ouvertures de ventilation. Installer en respectant les consignes du fabricant.
8. Ne pas installer à proximité d'une source de chaleur telle qu'un radiateur, une bouche de chaleur, un poêle ou d'autres appareils (dont les amplificateurs) produisant de la chaleur.
9. NE PAS détériorer la sécurité de la fiche polarisée ou de la fiche de terre. Une fiche polarisée comporte deux lames dont l'une est plus large que l'autre. Une fiche de terre comporte deux lames et une troisième broche de mise à la terre. La lame la plus large ou la troisième broche assure la sécurité de l'utilisateur. Si la fiche fournie ne s'adapte pas à la prise électrique, demander à un électricien de remplacer la prise hors normes.
10. PROTÉGER le cordon d'alimentation afin que personne ne marche dessus et que rien ne le pince, en particulier au niveau des fiches, des prises de courant et du point de sortie de l'appareil.
11. UTILISER UNIQUEMENT les accessoires spécifiés par le fabricant.
12.  UTILISER uniquement avec un chariot, un pied, un trépied, un support ou une table spécifié par le fabricant ou vendu avec l'appareil. Si un chariot est utilisé, déplacer l'ensemble chariot-appareil avec précaution afin de ne pas le renverser, ce qui pourrait entraîner des blessures.
13. DÉBRANCHER l'appareil pendant les orages ou quand il ne sera pas utilisé pendant longtemps.
14. CONFIER toute réparation à du personnel qualifié. Des réparations sont nécessaires si l'appareil est endommagé de quelque façon que ce soit, comme par exemple : cordon ou prise d'alimentation endommagé, liquide renversé ou objet tombé à l'intérieur de l'appareil, exposition de l'appareil à la pluie ou à l'humidité, appareil qui ne marche pas normalement ou que l'on a fait tomber.
15. NE PAS exposer cet appareil aux égouttements et aux éclabousses. NE PAS poser des objets contenant de l'eau, comme des vases, sur l'appareil.
16. La prise SECTEUR ou un adaptateur d'alimentation doit toujours rester prêt(e) à être utilisé(e).
17. Le bruit aérien de l'appareil ne dépasse pas 70 dB (A).
18. L'appareil de construction de CLASSE I doit être raccordé à une prise SECTEUR dotée d'une protection par mise à la terre.
19. Pour réduire les risques d'incendie ou de choc électrique, ne pas exposer cet appareil à la pluie ou à l'humidité.
20. Ne pas essayer de modifier ce produit. Une telle opération est susceptible d'entraîner des blessures ou la défaillance du produit.



Ce symbole indique la présence d'une tension dangereuse dans l'appareil constituant un risque de choc électrique.



Ce symbole indique que la documentation fournie avec l'appareil contient des instructions d'utilisation et d'entretien importantes.

AVERTISSEMENT : Les tensions à l'intérieur de cet équipement peuvent être mortelles. Aucune pièce interne réparable par l'utilisateur. Confier toute réparation à du personnel qualifié. Les certifications de sécurité sont invalidées lorsque le réglage de tension d'usine est changé.

DESCRIPTION

The DFR22 Audio Processor with Feedback Reduction is a 2-input, 2-output digital audio processor. It is designed to equalize sound system response, provide dynamics processing and alignment delay, and automatically detect and control acoustic feedback. A built-in 2 X 2 matrix mixer allows either or both inputs to be routed to either or both outputs, with additional controls for levels and polarity.

The DFR22 is ideal for installed sound reinforcement applications, such as houses of worship, theaters, and meeting facilities. It is also a powerful setup tool in live music applications. Using the DFR22's drag-and-drop graphical user interface, processors can be placed anywhere in the signal path.

DFR22 Features

- Shure's patented digital feedback reduction algorithm:
 - Now includes stereo DFR processing capability
 - New Auto Clear mode clears dynamic filters after a pre-set change or power cycle. Dynamic filters can be automatically removed after a specified number of hours.
- Configurable signal path with drag and drop Windows interface. Includes graphic and parametric EQ, up to 10 seconds of delay, compression, limiting, gating, automatic gain control, ducking, and a fully configurable two-way crossover.
- Phoenix and XLR connectors for each input and output
- Compatible with USB to serial port converters.
- Front and back panel RS232 ports:
 - 3-pin Phoenix connector on back panel.
 - DB9 connector on front panel; requires only TX, RX, and GND to be connected.
- Three pre-loaded presets:
 - Preset 1: Two mono 16 filter DFRs.
 - Preset 2: A stereo 16 filter DFR.
 - Preset 3: A mono 16 filter DFR on each input. Each input is routed to each output.
- Preset selector and indicator for up to 16 presets
- Control input pins for setting up remote preset, volume, and mute controls

PACKING LIST

- Power Cable
- 5-pin DIN ShureLink Cable
- 4 Rackmount Screws with Nylon Washers
- Five 3-Pin Block Connector Terminals (for audio input/output and RS-232 communication)
- One 6-pin Block Connector Terminals (for control inputs)
- One DFR22 Software CD-ROM and Online User Guide

REQUIREMENTS

Power Requirements

- 100–240 Vac, 50/60 Hz
- 45 W maximum

Computer Requirements

- 20 MB of hard drive space
- CD ROM drive
- RS-232 serial port and cable, or approved USB-to-Serial port adapter*
- VGA monitor with 640 x 480/256 color, or higher resolution
- Mouse or other pointing device

NOTE: Processor speed and memory requirements vary, depending on the version of Windows and number of background applications you are running. Operating the DFR22 software simultaneously with programs such as SIA-Smart® or Gold Line TEF™ requires a faster processor and more RAM. The chart below lists the minimum requirements for running the DFR22 software with no other applications—including virus protection, firewall, instant messaging, or email—in the background.

Windows Version	Processor Speed	RAM
98, Second Edition	Pentium 166 MHz	48 MB
NT	Pentium 233 MHz	64MB
ME	Pentium 300 MHz	64 MB
2000 Professional	Pentium 300 MHz	96 MB
XP Professional, Home	Pentium 300 MHz	128 MB

*Most USB-to-serial port adapters work well with the DFR22. To see the latest list of fully approved adapters, visit <http://www.shure.com/mixers/models/dfr22.asp>

SOFTWARE INSTALLATION

1. Insert supplied CD into your CD-ROM drive and follow the on-screen instructions.
2. If installation does NOT start automatically, click on the **[Start]** button the the Windows taskbar and select **[Run...]** from the pop-up menu.
3. Type **[D:\setup]**, where "D" is your CD-ROM drive letter.
4. Click **OK** and follow the on-screen instructions.

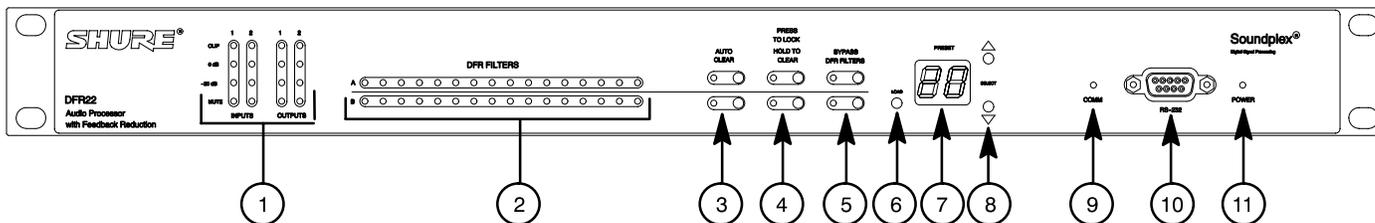
USING THE DFR22 SOFTWARE

Instructions for the DFR22 software are available in PDF format on the CD-ROM included with the system, or on the Shure web site at www.shure.com.

NOTE: Register this product by filling out and mailing the enclosed registration card, or register online at the Shure web site (www.shure.com). Registration allows you to receive information about software updates as they become available.

OVERVIEW

Front Panel



DFR22 FRONT PANEL

Figure 1

1. INPUT/OUTPUT Level Meters:

- **CLIP.** Illuminates at 3 dB below clipping level.
- **0 VU.** +4 dBu, –10 dBV; software selectable. 0 dB is equal to +4 dBu by default. If the input or output sensitivity is changed to –10 dBV using the DFR22 software, 0 dB equals –10 dBV.
- **–20 dB.** Illuminates when the signal meets or exceeds the indicated level.
- **MUTE.** Illuminates when input or output is muted.

2. **DFR Filter LEDs.** Illuminate when individual feedback filters are active. When a filter changes or is added, an LED flashes, then stays on.

3. **AUTO CLEAR Buttons and LEDs.** Press and release these buttons to configure Auto Clear mode for each channel. Press them again to activate Auto Clear. When an Auto Clear LED illuminates, Auto Clear is active on its corresponding channel.

4. **PRESS TO LOCK / HOLD TO CLEAR Button and LEDs.** Press this button to lock filters at their current values. Holding this button down will reset all feedback filters, even if they are locked. The LED lights to indicate that the lock is active.

5. **BYPASS DFR FILTERS Button and LEDs.** Press these buttons to suspend feedback reducer operation and remove feedback filters from the audio path. When a Bypass LED illuminates, feedback reduction is bypassed on the corresponding channel. Bypass does not affect other processors (such as equalizers, delay, limiters, etc.).

6. **LOAD Button.** Press this button to activate a selected preset.

7. **PRESET Indicator.** Shows the number of the currently active preset. Blinks to show the number of the other presets in the DFR22 when pressing the SELECT buttons.

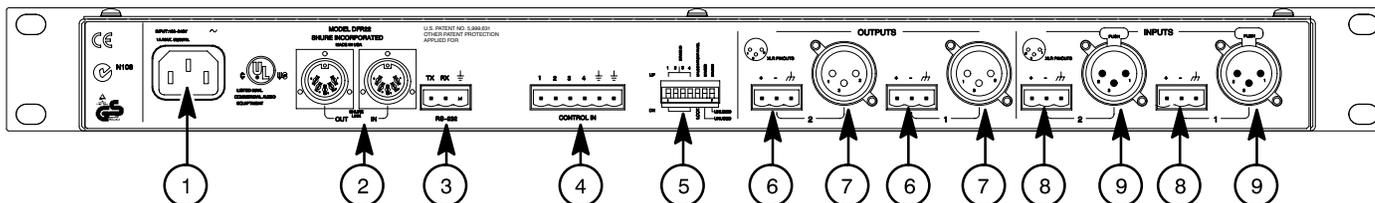
8. **SELECT Buttons.** Press to scroll through the presets stored in the DFR22.

9. **COMM LED.** Flashes in unison with the feedback filter LEDs when the detector is deploying a new filter or changing an existing one, and also blinks whenever the unit is communicating with a connected computer.

10. **RS232 Port.** Connects the DFR22 to a computer.

11. **POWER LED.** Illuminates when 100–240 VAC power is applied to the DFR22.

Back Panel



DFR22 REAR PANEL

Figure 2

1. **Power Connector.** Connects to 100–240 VAC power.

2. **Shure Link Interface.** Allows linking of up to 16 Shure Link devices, which may be accessed by a computer.

3. **3-Pin RS-232 Port.** Connects the DFR22 to a computer. For use with DFR22 software and control systems. Refer to the Computer Connections section.

4. **CONTROL IN Pins.** Use control input pins for remote control of preset switching, muting, and gain. Refer to the Control Pin Connections section.

5. **DIP Switches.** Use Switches 1–4 to select a Shure Link Device ID. Use Switch 5 to lock or unlock front panel controls. Refer to the Front Panel Lockout section for information on locking front panel controls.

6. **Output Connectors (Phoenix).** These active, cross-coupled, balanced outputs can be used with balanced or unbalanced inputs. They can be switched between +4 dBu/–10 dBV line-level operation, using the DFR22 software. Refer to the Audio Connections section.

7. **Output Connectors (XLR).** These active, cross-coupled, balanced outputs can be used with balanced or unbalanced inputs. They can be switched between +4 dBu/–10 dBV line-level operation using the DFR22 software. Refer to the Audio Connections section.

8. **Input Connectors (Phoenix).** These active balanced inputs can be used with balanced or unbalanced outputs. They cannot be used simultaneously with an XLR connector for the same input. They can be switched between +4 dBu/–10 dBV line-level operation using the DFR22 software. Refer to the Audio Connections section.

9. **Input Connectors (XLR).** These active balanced inputs can be used with balanced or unbalanced outputs. They cannot be used simultaneously with a Phoenix connector for the same input. They can be switched between +4 dBu/–10 dBV line-level operation using the DFR22 software. See Audio Connections section for more information.

DEFAULT PRESETS

The DFR22 comes with three factory-configured presets. Although a computer is required to configure the DFR22's equalizers, dynamics processors, delays, and crossover, you can use the DFR22 "out of the box" as an automatic feedback reducer, without connecting it to a computer.

Preset 1: Provides two independent feedback reducers. The audio signal going to Input 1 is analyzed and filtered by a feedback reducer using up to 16 notch filters, and is then routed to Output 1. Input 2 is analyzed by another feedback reducer and then routed to Output 2. On the front panel, Row A of the DFR Filters and controls is assigned to the feedback reducer on Input 1; Row B is assigned to the feedback reducer on Input 2.

Preset 2: Provides a stereo feedback reducer. Signal going into each input is analyzed independently, but the feedback reducer applies the same notch filters to each channel. As with Preset 1, Row A of the DFR filters and controls on the front panel is assigned to the feedback reducer on Input 1; row B is assigned to the feedback reducer on Input 2. Because the feedback reducers always apply the same filters to both channels, the DFR filter indicators and controls are linked.

Preset 3: Similar to Preset 1, except both inputs are routed to both outputs.

FRONT PANEL CONTROL FUNCTIONS

Auto Clear

By default, the DFR22 saves all feedback filters during a preset change or power cycle. However, you can configure the device to automatically remove dynamic feedback filters and changes to the depth of fixed feedback filters, according to parameters that you specify.

Each time the DFR22 detects a feedback frequency, it assigns that frequency to one of the filters. By default, the first eight frequencies are assigned to fixed filters, and the second eight are assigned to dynamic filters. Both types of filters can deepen if feedback reoccurs at the same frequency. The frequency of a fixed filter will not change unless you manually clear all of the filters. However, if all filters are in use and an additional feedback frequency is detected, the DFR22 replaces the oldest existing *dynamic* filter with a new filter at a new frequency.

Establishing the Auto Clear Function. To establish the Auto Clear function, proceed as follows:

NOTE: The procedure for setting up the Auto Clear function using the front panel controls differs slightly from the procedure in the DFR22 Windows software.

1. Ring out the sound system to set any feedback filters that you want to be a permanent part of the system equalization.
2. Press the Auto Clear button on the DFR22 front panel. The Auto Clear button will blink. Auto Clear will automatically redesignate any engaged filters as fixed and the rest as dynamic. For example, if you have five filters set, Auto Clear will designate those as fixed and will designate the remaining 11 filters as dynamic.
3. The preset indicator will display a flashing [-h]. If you want Auto Clear to work automatically after a certain number of hours, you must use the Preset Select buttons to set the number of hours (1 to 99). Each filter has its own timer, starting from the time it is set or changed. If you leave the preset indicator at [-h], Auto Clear will only work on a preset change or power cycle.
4. Press either the LOAD button or the AUTO CLEAR button again. The AUTO CLEAR LED will glow steadily.
5. When a preset is changed, or if power is turned off and on, the DFR filters will return to the state they were in when Auto Clear was engaged. If a number of hours was specified, each dynamic filter and change to the depth of each fixed filter will be removed that many hours after it is set.

Disengaging the Auto Clear Function. To disengage the Auto Clear function, press the AUTO CLEAR button again. The Auto Clear LED will go out, and the number of fixed filters and dynamic filters will reset to eight of each type.

NOTE: Holding the clear button down while Auto Clear is engaged will only clear the dynamic filters.

Press to Lock / Hold to Clear

Pressing these buttons locks the filters at their current values. If Auto Clear is not engaged, holding them down for three seconds resets all filters. If Auto Clear is engaged, holding them down only resets dynamic filters. When the PRESS TO LOCK/ HOLD TO CLEAR LEDs are illuminated, the Lock function is engaged and no filters can be added or changed. Also, the Auto Clear timer is suspended.

Bypass DFR Filters

Pressing the DFR BYPASS button suspends the feedback reducer operation and bypasses existing feedback filters. It does NOT affect any other processors. When the DFR BYPASS LED illuminates, the feedback reducer is disengaged.

Changing Presets

The Preset Indicator on the front panel displays the number of the active preset. You can scroll through all presets stored in the device by pressing the arrow keys on the preset selector. When you select a preset number, the display blinks. If you press the LOAD button within five seconds, the device will make the selected preset the new Live preset. If you do not press the LOAD button, the preset will not change and the display will return to the original Live preset.

The preset indicator and controls are also used for setting the number of hours after which each dynamic filter is removed when engaging Auto Clear.

Front Panel Lockout

When this DIP switch is in the "Unlock" position, all front panel controls are enabled. When it is in the "Lock" position, all front panel controls are disabled. However, all front panel indicators still function and show the state of each parameter.

You can override this DIP switch using the DFR22 software and individually enable or disable each button on the front panel of the DFR22. Access to the DFR22 via a computer can only be disabled by setting the appropriate security level through the DFR22 software.

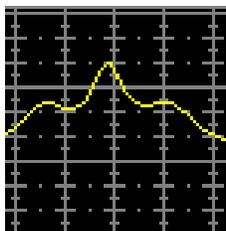
DFR22 Theory

Feedback Reduction

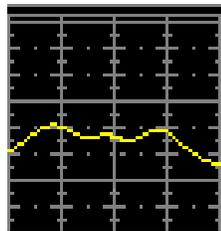
No sound system (microphones + mixing/signal processing + power amplifiers/loudspeakers + room acoustics) has an absolutely flat frequency response. When the level of a sound system is increased, the frequencies at which peaks occur will be the first to exceed the feedback threshold. The DFR22 attenuates these frequencies, flattening the response of the sound system. The system can then operate at a higher overall level.

The DFR22 includes Shure's patented Adaptive Notch Filter algorithm that can discriminate between feedback and non-feedback sounds. When this algorithm detects feedback, it inserts a shallow, narrow filter into the audio path, reducing gain at the frequency that is feeding back. (See Figure 3.) This filter is called a notch filter, since it affects a narrow section of the audio spectrum. If the feedback does not stop, the filter depth is increased. By default, filters in the DFR22 are deployed as HIGH Q filters. As a High Q filter gets deeper, its Q increases up to a Q of 101 (1/70th of an octave). Using the DFR22 software, you can also set filters to deploy as LOW Q. Low Q filters affect a slightly wider range of frequencies by maintaining a Q of 14.42 (1/10th of an octave) as they deepen. By default, the DFR22 can insert up to 16 notch filters per channel to reduce feedback.

The DFR22's feedback reduction algorithm can be used as a tool during system setup and for peace of mind against unexpected feedback. When setting up a sound system with the DFR22, you can ring out the system by slowly raising the gain while talking into the microphones until the first frequency begins to feed back. The DFR22 will automatically insert a notch filter to attenuate that frequency. Once the system stops feeding back, you can further raise the level and repeat the process for additional frequencies. Typically, you can raise the gain 3 – 9 dB above the level at which feedback first occurred. You should leave some filters available to catch feedback that might occur later, when the sound system is in use.



Measured Frequency Response with Peak



Measured Frequency Response with Notch Filter Added

EFFECTS OF NOTCH FILTER ON FREQUENCY RESPONSE

Figure 3

DFR22 Limitations

The DFR22 (or any other feedback reduction processor) will not let you to increase gain beyond the physical limits of the sound system. In most cases, the point of diminishing returns is reached once 5 to 8 notch filters have been set. This is because there are usually only a few dominant peaks in a system's frequency response (Figure 4A). In most cases, you can expect a 6 to 9 dB improvement in gain-before-feedback. When you are ringing out a system and notice that many frequencies feed back simultaneously, even when you increase the gain slowly, you have reached the point of diminishing returns. If the system still has insufficient gain before feedback at this point, other changes must be made to the sound system, such as changing the placement of the microphones and/or loudspeakers.

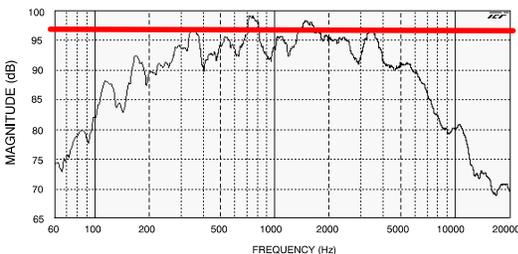


Figure 4A

Use notch filters to lower peaks

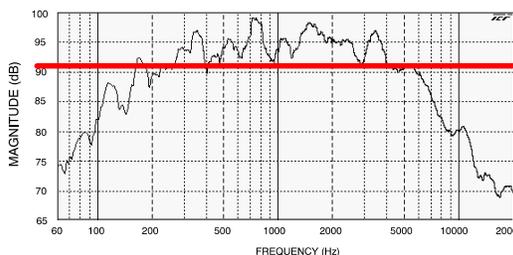


Figure 4B

Lower overall system gain

— = Feedback Threshold

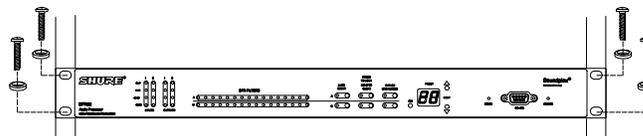
FREQUENCY RESPONSE OF AN UNEQUALIZED SOUND SYSTEM

Figure 4

RACK MOUNTING THE DFR22

Mount the DFR22 in any standard 19-inch audio equipment rack, using the supplied screws. Refer to Figure 5.

NOTE: Avoid mounting wireless equipment and power amplifiers directly above or below the DFR22. Additional rack mount supports may be necessary for mobile installations.



RACK MOUNTING THE DFR22

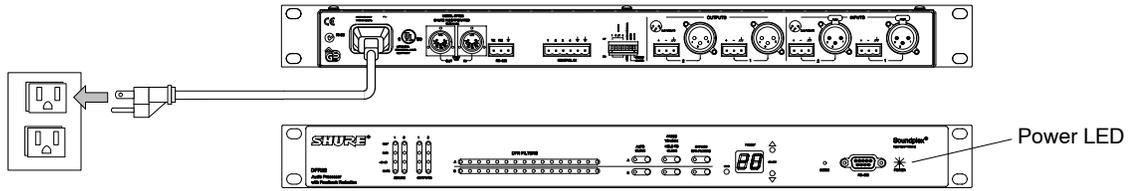
Figure 5

POWER AND INITIALIZATION

Power Mains Connections

Use the supplied power cable to connect the DFR22 Audio Processor to an active 100–240 Vac power source, as shown in Figure 6. The Power LED on the front panel will glow green when power is applied.

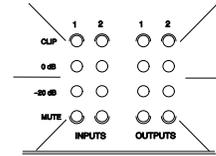
NOTE: The DFR22 Audio Processor is designed to operate continuously. Therefore, there is no power on/off switch.



DFR22 POWER CONNECTION
Figure 6

Initialization

Once power is applied, the DFR22 Audio Processor takes approximately 5 seconds to initialize. When initialization is complete, the Input/Output LEDs will flash, as shown in Figure 7. The DFR22 is ready to use once the LEDs stop flashing.



DFR22 INITIALIZATION
Figure 7

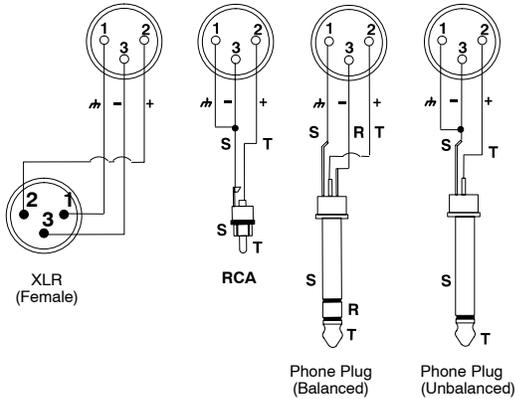
AUDIO CONNECTIONS

NOTE: Audio will pass from the inputs to the outputs, even if it has not yet been configured through the computer interface.

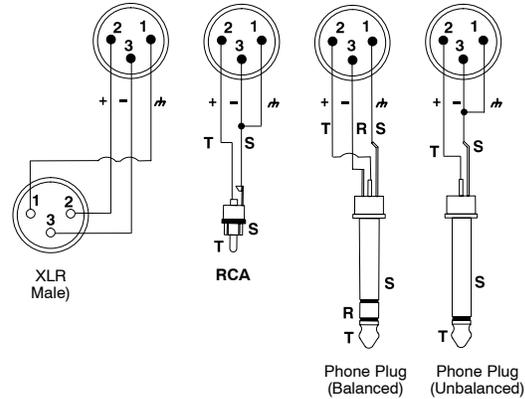
CAUTION: DO NOT connect equipment to both the Phoenix and XLR connectors of the same input or output at the same time. Doing so could damage the equipment.

Wiring Connectors

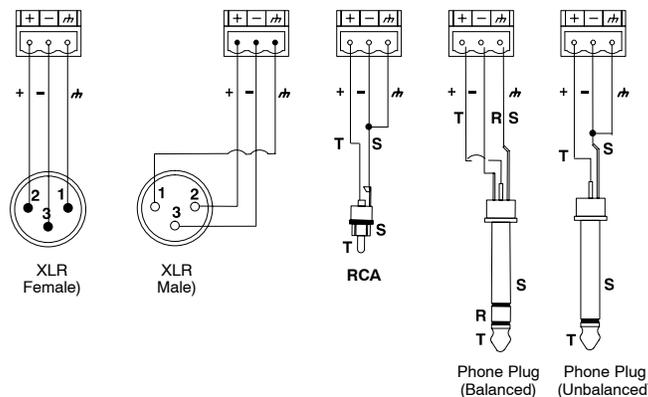
DFR22 XLR CONNECTORS (OUTPUT)



DFR22 XLR CONNECTORS (INPUT)



DFR22 PHOENIX CONNECTOR OUTPUTS / INPUTS



INPUT/OUTPUT CONNECTOR WIRING DIAGRAMS
Figure 8

12 dB and 18 dB Output Pads

Each DFR22 output has a 12 dB pad and an 18 dB pad that can be engaged through the software interface. Use these pads when connecting the DFR22 to lower-level inputs. They cannot be used to prevent clipping at the output stage of the DFR22

NOTE: The Output meters indicate the signal level present at the digital-to-analog converters. The 12 and 18 dB pads act upon the signal after the digital-to-analog converters, so the meters do not reflect the pads.

COMPUTER CONNECTIONS

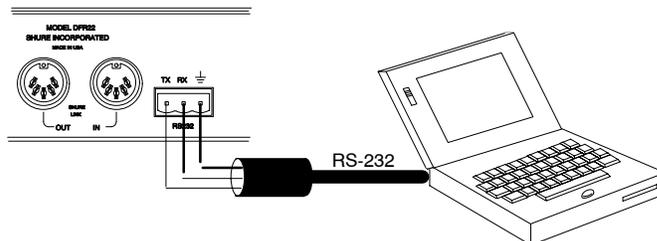
RS-232 Connections

Connect the COM port on your computer to the 9-pin RS-232 connector on the front panel of the DFR22, shown in Figure 9, using a male-to-female serial cable. Pin outs for a 9-pin RS-232 cable are shown in Figure 10 and listed in Table 1.

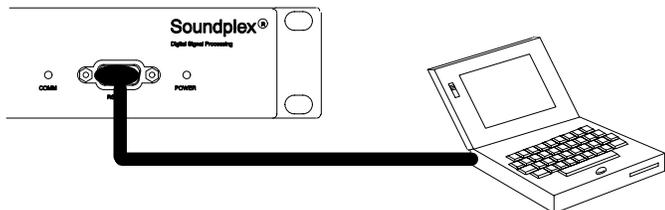
NOTE: Only the TX, RX, and GND pins need to be connected in order to communicate with the DFR22.

You can also connect a computer or control system to the 3-pin RS-232 Phoenix connector on the back panel of the DFR22, as shown in Figure 11.

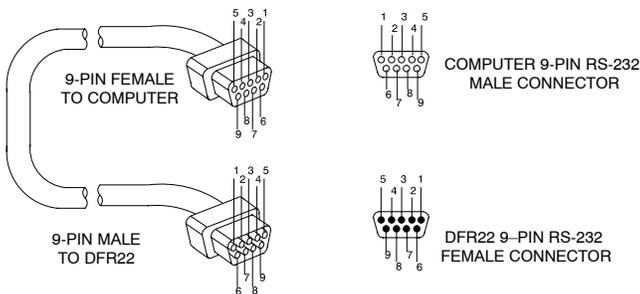
IMPORTANT: You CANNOT connect two PCs to the DFR22 at the same time. However, you CAN connect an AMX or Crestron system and a PC to the DFR22 at the same time.



PHOENIX RS-232 SERIAL PORT CONNECTION
Figure 11



RS-232 SERIAL PORT CONNECTION
Figure 9



RS-232 CABLE PINOUTS
Figure 10

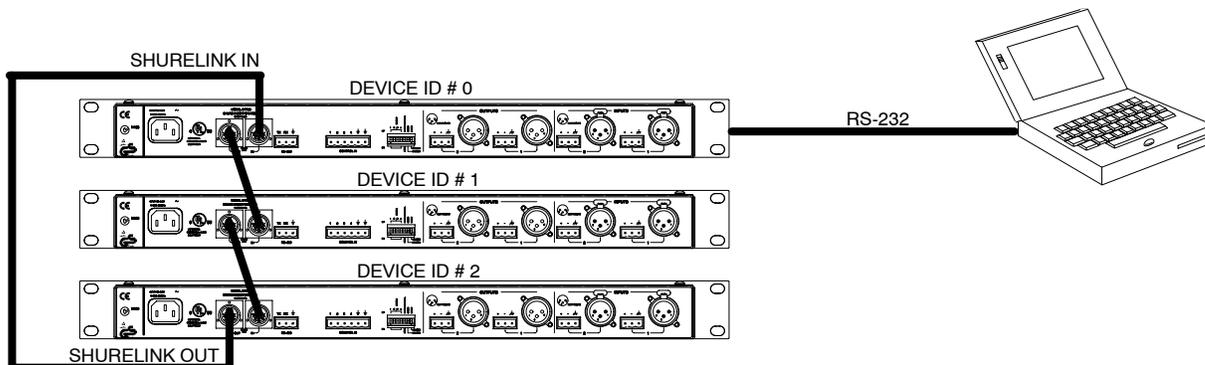
Table 1. RS-232 PIN OUTS

DFR22	COMPUTER	PIN NO.
—	—	1
TX	RX	2
RX	TX	3
—	DTR	4
GND	GND	5
—	DSR	6
—	RTS	7
—	CTS	8
—	—	9

Shure Link Network

Up to 16 Shure Link devices, including the DFR22, DFR11EQ, DP11EQ, P4800, and UA888, can be linked and controlled from one computer. Using 5-pin DIN cables, connect the **Shure Link IN** and **Shure Link OUT** of each device, as shown in Figure 12.

NOTE: The last device in the chain **MUST** be connected to the first device (the one connected directly to the computer) to form a loop.

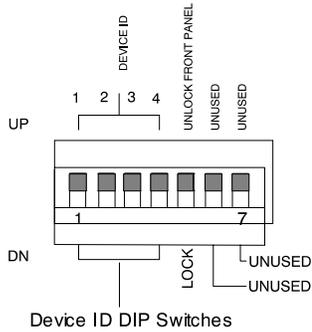


SHURELINK NETWORK CONNECTIONS
Figure 12

DIP Switch Settings for Networked Devices

Assign each Shure Link device a unique Device ID Number, using DIP Switches 1–4, as shown in Figure 13. Refer to Table 2 for Device ID settings.

IMPORTANT: Each Shure Link device MUST have a unique Device ID number.



DIP SWITCH SETTINGS FOR NETWORKED DEVICES
Figure 13

Table 2. DEVICE ID SETTINGS

Device ID	DIP Switch				Device ID	DIP Switch			
	1	2	3	4		1	2	3	4
0	DN	DN	DN	DN	8	DN	DN	DN	UP
1	UP	DN	DN	DN	9	UP	DN	DN	UP
2	DN	UP	DN	DN	10	DN	UP	DN	UP
3	UP	UP	DN	DN	11	UP	UP	DN	UP
4	DN	DN	UP	DN	12	DN	DN	UP	UP
5	UP	DN	UP	DN	13	UP	DN	UP	UP
6	DN	UP	UP	DN	14	DN	UP	UP	UP
7	UP	UP	UP	DN	15*	UP	UP	UP	UP

*Default setting.

CONTROL PIN CONNECTIONS

The control pins on the back of the DFR22 connect to switches, potentiometers, and controller hardware. The Control Input pins can be used to change presets, adjust gain, and mute channels.

NOTE: Use the DFR22 software to configure the control pins so that they match the attached control hardware. You can also use the software to assign minimum and maximum gain values for each control, as well as the gain increment for up/down volume control buttons. Refer to the *Control Pin* section of the Online Help or to the Online User Guide.

Determining Control Pin Allocations

When allocating control pins, you should first determine which pins are to be used for *preset control*. Any remaining pins can then be used to adjust gain or to mute channels. The number of pins needed for preset control depends on the type of control hardware used, as well as the number of presets.

The following methods can be used to allocate control pins:

- **One-to-One:** Use one pin for each preset, starting at Pin 1, and proceeding toward the right. You **MUST** use consecutive pins. Connect momentary or latching switches.
- **Shure DRS10 Switch:** Use Pin 1 for up to 10 presets.
- **Custom Switch:** Use Pin 1 for up to 10 presets.
- **Binary:** Use the pin numbers listed in Table 3. Connect latching switches.

Table 3. BINARY CONTROL PIN ALLOCATION

Number of Presets	Pin Numbers
2	1
4	1 and 2
8	1–3
16	1–4

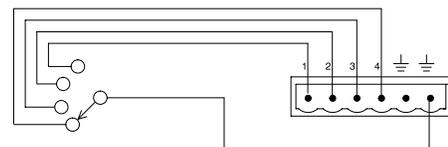
Preset Control Connections

Various types of control hardware can be connected to the Control Input pins, as shown in Figure 14. When properly configured, the DFR22 changes to the appropriate preset in response to the switch. Resistor values for custom switches and the Shure DRS10 are listed in Table 4.

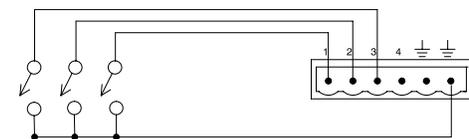
NOTE: The total resistance of the cable run, from the switch to the DFR22, should be less than 100 ohms. Two-conductor, unshielded cable, such as a Belden 8442, is recommended.

Table 4. CUSTOM SWITCH RESISTOR VALUES

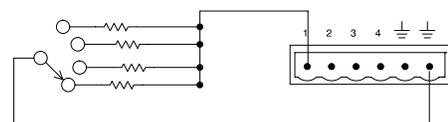
PRESET	RESISTOR VALUE
1	97 k Ω – ∞ Ω
2	44–60 k Ω
3	26–32 k Ω
4	17–20 k Ω
5	11.3–13.6 k Ω
6	7.8–9.3 k Ω
7	5.2–6.3 k Ω
8	3.3–4.1 k Ω
9	1.9–2.5 k Ω
10	0.63–1.1 k Ω



One-to-one Configuration
(Each pin represents one preset)



Binary Configuration



Shure DRS10 or Custom Switch Configuration*

WIRING CONTROL INPUT PINS FOR PRESET CONTROL
Figure 14

Mute Control Connections

For mute control, use either a latching switch or a momentary switch. The total resistance of the cable run from the switch to the DFR22 should be less than 100 ohms.

Figure 15 shows an example of how to connect either a latching switch or a momentary switch to the Control Input pins to mute an input or an output.



MUTE CONTROL PIN CONNECTIONS

Figure 15

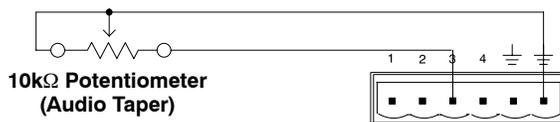
Gain Control Connections

For gain control, use either a potentiometer or two momentary switches (one for gain up and one for gain down). If you want to have multiple sets of gain controls acting on the same inputs or outputs, use momentary switches connected in parallel. Figure 16 shows a typical connection between a potentiometer and the Control Input pins. Figure 17 shows a typical connection between two momentary switches and the Control Input pins.

When using a potentiometer, the total resistance of the cable run should be less than 100 ohms.

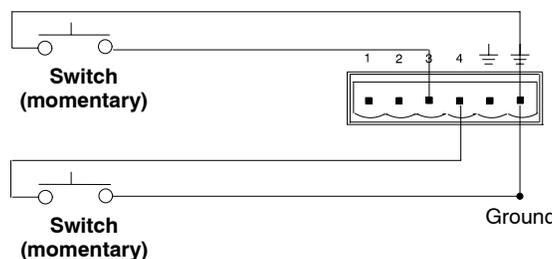
When using momentary switches, the total resistance of the cable run should be less than 100 ohms.

NOTE: As supplied, the DFR22 control pins are configured for use with a 10 Kohm audio taper potentiometer. However, you can use the Potentiometer Calibration Wizard in the DFR22 software to configure the DFR22 for use with any 10 Kohm, 20 Kohm, 50 Kohm, or 100 Kohm linear or audio taper potentiometer.



GAIN CONTROL PIN CONNECTIONS USING A POTENTIOMETER

Figure 16



GAIN CONTROL PIN CONNECTIONS USING SWITCHES

Figure 17

AMX / Crestron Control Connections

You can connect an AMX or Crestron controller to the back panel RS-232 port, using a Phoenix connector, or to the front panel RS-232 port, using a DB-9 connector. In either case, you only need to connect three wires: send, receive, and ground. See page 8 for the pinout of the RS-232 ports.

To access AMX/Crestron control codes for the DFR22, visit the DFR22 web page at <http://www.shure.com/mixers/models/DFR22.asp>.

SPECIFICATIONS

Frequency Response

20 Hz to 20 kHz ± 1 dB

Dynamic Range

110 dB minimum, A-weighted, 20 Hz to 20 kHz

Sampling Rate

48 kHz

Digital-to-Analog, Analog-to-Digital Conversion

24 bit

Impedance

Input: 10 Ω

Output: 120 Ω

Input Clipping Level

+24 dBu minimum

Output Clipping Level

+24 dBu

+12 dBu (with 12 dB pad)

+6 dBu (with 18 dB pad)

Total Harmonic Distortion

< 0.05%, +4 dBu, 20 Hz to 20 kHz

Propagation Delay from Input to Output

< 1.5 ms

Polarity

Input to output: non-inverting (inverting optional)

Operating Voltage

100–240 Vac, 50/60 Hz (auto-switching), 1 A, maximum

Maximum Power Drain

45W

Temperature Range

Operating: -7° to 49° C (19° to 120° F)

Storage: -29° to 74° C (-20° to 165° F)

Dimensions

482.6 mm x 247.7 mm x 44.4 mm (19 in. x 9.75 in. x 1.75 in.)

(See Figure 18)

Weight

2.83 kg (6.25 lbs)

Furnished Accessories

Power Cable (DFR22) 95B8389

Power Cable (DFR22E) 95C8247

5-pin DIN Shure Link Cable 95B8676

Hardware Kit 90AY8100

12 Block Connector Terminals, 3-pin
(for audio inputs and outputs)

2 Block Connector Terminals, 10-pin
(for control inputs and outputs)

4 Rackmount Screws and Washers

Optional Accessories

DRS10 Wallplate unit with 10-position rotary switch for preset control

Certifications

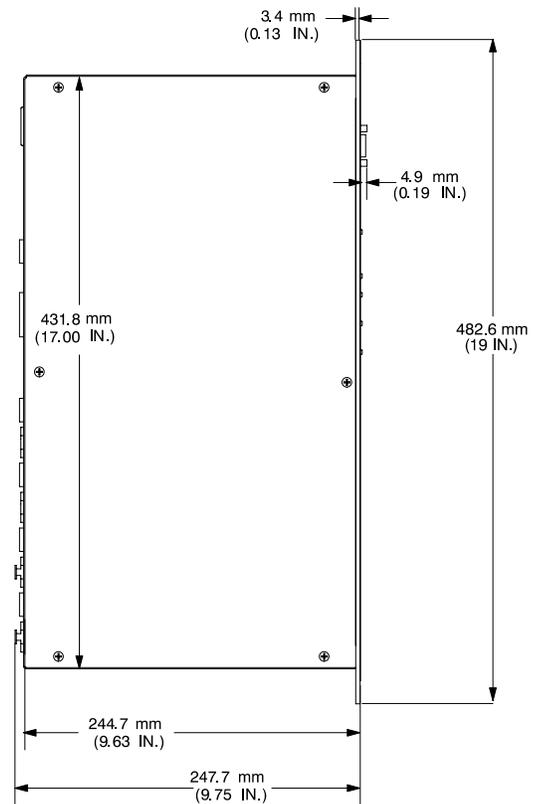
cULus. Listed and cUL Listed to UL 6500 and CSA E60065. Authorized under Verification provision of FCC Part 15 as a Class B Digital Device.

This Class B digital apparatus complies with Canadian ICES-003.

Conforms to European Union Directives, eligible to bear CE marking. Meets European Union Low Voltage Requirements: Certified to EN 60065. Meets applicable tests and performance criteria in European Standard EN55103 (1996) parts 1 and 2, for residential (E1) and commercial and light industrial (E2) environments.

NOTE: EMC conformance testing is based on the use of supplied and recommended cable types. The use of other cable types may degrade EMC performance.

EMC conformance testing is based on the fact that the computer is used for setup purposes only and disconnected during EMC testing.



DFR22 DIMENSIONS
Figure 18

Information to User

Changes or modifications not expressly approved by Shure Incorporated could void your authority to operate this equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

LIMITED TWO YEAR WARRANTY

Shure Incorporated ("Shure") hereby warrants that this product will be free from defects in materials and workmanship for a period of two years from the date of purchase. At its option Shure will repair or replace the defective product and promptly return it to you, or refund the purchase price. You should retain proof of purchase to validate the purchase date and return it with any warranty claim.

If you believe this product is defective within the warranty period, carefully repack the unit, insure it, and return it postage prepaid to:

Shure Incorporated
Attention: Service Department
5800 W. Touhy Avenue
Niles, IL 60714-4608 U.S.A.

Outside the United States, return the product to your dealer or Authorized Service Center.

This warranty does not apply in cases of abuse or misuse of the product, use contrary to Shure's instruction, or unauthorized repair. All implied WARRANTIES OF MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE are hereby disclaimed and Shure hereby disclaims liability for incidental, special, or consequential damages resulting from the use or unavailability of this product.

Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

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