

# Model 41 *Interface*

## Line-Level Audio to IFB Circuit Interface

### Highlights

- Transformer-coupled inputs
- Excellent audio quality
- Superior power-feed performance
- Four independent IFB circuits
- Single (1U) rack-space mounting
- Universal mains input powering

### Introduction

The Model 41 is designed to create broadcast-standard IFB circuits from line-level audio sources. The unit's primary application is to interface analog outputs associated with digital matrix intercom systems with broadcast IFB user devices. The Model 41 provides four independent IFB circuits. Each IFB circuit provides DC power and two analog audio signals to support the connected IFB user devices. The Model 41's audio quality is excellent; little hiss, hum, or other artifacts are present. To ensure optimal operation, the unit provides resources for visually and audibly monitoring the audio output signals. In addition, the DC output voltage is monitored for over-current and short circuit conditions.

Installation of the Model 41 is very simple. Audio input connections are made using a 25-pin D-subminiature connector. The IFB output circuits interface using standard 3-pin XLR-type connectors. The compact, one-rack-space (1U) package is constructed using heavy-gauge steel components. The unit's mains power input can range from 100 to 230 volts, 50/60 hertz. This "universal input" ensures correct operation virtually anywhere in the world.

There may be persons not familiar with the term IFB. That's not unreasonable as it's a somewhat obscure acronym for interruptible foldback. On its own, the term foldback is an alternate way of describing a cue or monitor function. Adding "interruptible" before it means that the cue source can be temporarily replaced with an audio signal originating from a producer, director, or other production personnel. IFB circuits are often used in the broadcast industry for talent cueing applications, both in studio and field settings. Both "dry" and "wet" IFB circuits can be deployed and their characteristics are worth reviewing. The term "dry" IFB typically refers to a transformer-balanced line-level audio circuit with a nominal level in the range of 0 to +8 dBu. This is essentially a standard audio circuit that is commonly used to interconnect audio equipment. The term "wet" IFB refers to a circuit that combines DC power and one or two channels of analog audio. The nominal level of the DC power source is typically in the range of 30 to 32 volts. The audio is unbalanced with a typical nominal level of -10 dBu. The Model 41 implements wet IFB circuits. As such, in this user guide the term IFB will always represent this type of circuit.

IFB circuits provide an effective means of delivering power and two channels of audio to user devices by means of standard audio cables. These cables, ubiquitous to the audio industry, interface using 3-pin male and female XLR-type connectors. Using IFB circuits and standard audio cables it's a simple matter to support user devices such as listen-only belt packs and announcer's consoles with no external



power source required. Whether the IFB source and user devices are 100 or 1000 feet apart, reliable operation can almost always be provided.

In many cases, the Model 41 Interface will be used in on-air television applications. Whether installed in a fixed location or as part of a remote facility, the unit is capable of providing excellent performance. In addition, the Model 41 is applicable for non-broadcast applications. For example, audio recording and post-production facilities can also effectively use the Model 41. Combined with stereo or mono listen-only belt packs, also available from Studio Technologies, a variety of headphone cue systems can easily be deployed. And since the Model 41's audio inputs are compatible with standard line-level audio signals virtually any analog source can be connected.

### **Four Independent IFB Circuits**

The Model 41 supplies four independent IFB circuits. Each circuit consists of two audio inputs and a 2-channel "wet" IFB output. The audio inputs are transformer coupled, have a nominal level of +4 dBu, and are compatible with balanced or unbalanced sources. In on-air television broadcast applications the audio sources will often be analog outputs from matrix intercom systems. Two sources are typically designated to serve as user cue signals. Generally one source is configured in the matrix intercom system as "interrupt" while the other is configured as "program." An alternate term often used for the "interrupt" channel is "program-with-interrupt." This may be more descriptive as the function is actually a program source that gets interrupted with talkback audio. The "program" channel is typically a continuous source of program audio. An alternate term is "program-only." For other applications, the Model 41's audio inputs can be connected to a 2-channel or stereo audio source. This configuration may prove useful in radio broadcasting, audio-with-picture, or recording studio applications. The specific application will dictate whether both cue signals will be utilized by the end user. In on-air sports broadcast situations a "double-muff" (stereo) headset will provide a user with both audio channels, one for each ear. In interview or news-gathering applications it's common to use a single "earpiece" to provide a user with program-with-interrupt audio.

Maintaining excellent audio performance was a major Model 41 design goal—the hiss, hum, and noise associated with typical IFB circuits was simply not acceptable. The Model 41 meets those requirements with audio that is "on-air" quality:

low distortion, high signal-to-noise ratio, and ample headroom. On-air talent and guests, production personnel, and technicians will all appreciate the clean, quiet cue signal.

The Model 41's IFB circuits provide DC power and two channels of unbalanced audio over a single 3-conductor output. The DC output is nominally 30 volts with a maximum rated current of 200 milliamperes. A major strength of the Model 41 is the IFB circuit's ability to effectively deliver DC power over a variety of conditions. Unlike other interface devices that use a common but less-than-ideal circuit topology, a unique IFB circuit was developed by Studio Technologies to achieve the desired performance goals. The result is a major improvement in effectively supporting IFB user devices over a wide range of conditions. Connected devices can draw up to the full rated 200 milliamperes of current with little drop in DC voltage. This output voltage stability is the key—whether drawing 50, 100, or 200 milliamperes, the output will remain close to 30 volts. In practical terms this means that reliable IFB-based cue systems can now be deployed in more stadiums, concert halls, or motor racing facilities than was previously possible; longer cable runs, more user devices, excellent performance.

### **Audio Monitoring**

To help confirm proper installation and ensure correct operation, the Model 41 includes a full-featured audio monitor section. Two 5-segment LED meters provide an indication of the audio levels as they appear directly on the IFB output connectors. This capability makes it simple to adjust and maintain correct audio levels so that optimal IFB performance can be maintained. A headphone output is also provided, allowing "real world" checking of IFB audio quality. In addition to being able to manually select the IFB circuit to be monitored by the meters and headphone output, an "auto scan" mode is also included. This allows each of the four IFB circuits to be monitored in a continuously repeating sequence.

### **DC Monitoring and Fault Shut Down**

To prevent possible damage to the Model 41's output circuitry and connected user devices, the DC output voltage present on pin 2 of each IFB circuit is continually monitored. If the voltage on an IFB circuit falls below 24 volts its associated LED will "flash" as an error indication. If this under-voltage condition continues for more than 4 seconds a shut down mode will be entered, turning off power to the IFB circuit. After a 10-second interval the output will again become active.

## Compatibility

The Model 41 is compatible with virtually every digital matrix intercom system, including those from Clear-Com®, Drake, RTS®, and Riedel®. Interfacing requires only the connection of analog output ports from the intercom system to the Model 41's audio inputs. Optimal performance might be gained by configuring the nominal audio level of the intercom system's "virtual" IFB output ports to match the Model 41's +4 dBu input level. With the Model 41's excellent audio and power delivery performance it's an ideal alternative to the interface devices offered by the intercom system vendors. Using the Model 41 the intercom system's audio quality can be maintained all the way to the IFB users.

The Model 41's IFB circuits allow virtually every IFB user device to be supported. These include the Model 30-series listen-only belt packs and Model 200-series announcer console products from Studio Technologies. The 200-series

units combine a variety of microphone control, headphone monitoring, IFB and intercom system interfacing, and related functions into compact desktop units. Industry-standard listen-only belt packs from RTS, including the 4020 and 4030, can also be directly supported.

## Alternate Applications

In addition to broadcast intercom applications, the Model 41 can be used to create high-performance stereo headphone cue systems. Line-level signals coming from an audio console, a routing switcher, or an off-air receiver can be connected to the Model 41's audio inputs. The IFB circuits can be connected to listen-only belt packs, several models of which are available from Studio Technologies. For example, the Model 35 Talent Amplifier will allow one or two pairs of stereo headphones to be supported. Each of the Model 41's four IFB circuits will support up to six Model 35 Talent Amplifiers.

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## Model 41 Specifications

### **General Audio:**

Frequency Response:

Pin 2 Outputs (DC with Channel 1 Audio): 20 Hz-20 kHz  $\pm 2.5$  dB (80 Hz-20 kHz  $\pm 0.25$  dB)

Pin 3 Outputs (Channel 2 Audio): 20 Hz-20 kHz  $\pm 0.25$  dB

Distortion (THD+N): 0.01%, measured at 1 kHz, +4 dBu, pin 2 outputs (DC with channel 1 audio)

S/N Ratio: 80 dB, ref +4 dBu out, 20 Hz-20 kHz, pin 2 outputs (DC with channel 1 audio)

Crosstalk: 81 dB, typical, ref +4 dBu in, 20 Hz-20 kHz

**Audio Inputs:** 8, organized as four 2-channel inputs

Type: transformer balanced, capacitor coupled, compatible with balanced or unbalanced sources

Impedance: 10 k ohms, nominal

Nominal Level: +4 dBu

### **IFB Output Circuits:** 4

Type: DC power with two channels of unbalanced audio

Connections: common on pin 1, DC (+30 V nominal) modulated with channel 1 audio (-10 dBu nominal) on pin 2, and channel 2 audio (-10 dBu nominal) on pin 3

Maximum Audio Output Level:

Pin 2: +9 dBu with +23 dBu on audio input

Pin 3: +14 dBu with +28 dBu on audio input

DC Current Output: 200 mA maximum

### **Monitor Section – Headphone Output:**

Type: 2-channel (stereo), drives headphones by way of 100 ohm series resistors

Compatibility: intended for connection to headphones with impedance of 100 ohms or greater

Maximum Voltage: 8 Vpp, 100 ohm load

### **Monitor Section – Output Voltage Detection:**

Measures DC voltage level directly on pin 2 of IFB circuit output connectors. Status LEDs flash when level is less than approximately 24 volts DC.

### **Connectors:**

Audio Inputs: 25-pin D-subminiature female, 4-40 threads

IFB Outputs: 3-pin male XLR-type

Headphone Output: 1/4-inch 3-conductor phone jack

AC Mains: 3-blade, IEC 320 C14-compatible (mates with IEC 320 C13)

**AC Mains Requirement:** 100-230 volts, 50/60 Hz, 0.7 A maximum @ 100 volts, 0.4 A maximum @ 230 volts

### **Dimensions (Overall):**

19.00 inches wide (48.3 cm)

1.72 inches high (4.4 cm)

9.58 inches deep (24.3 cm)

**Mounting:** one space (1U) in a standard 19-inch rack

**Weight:** 6.6 pounds (3.0 kg)

Specifications subject to change without notice.

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