

SERIES 4000 IFB SYSTEM

OVERVIEW

CONTROL STATIONS

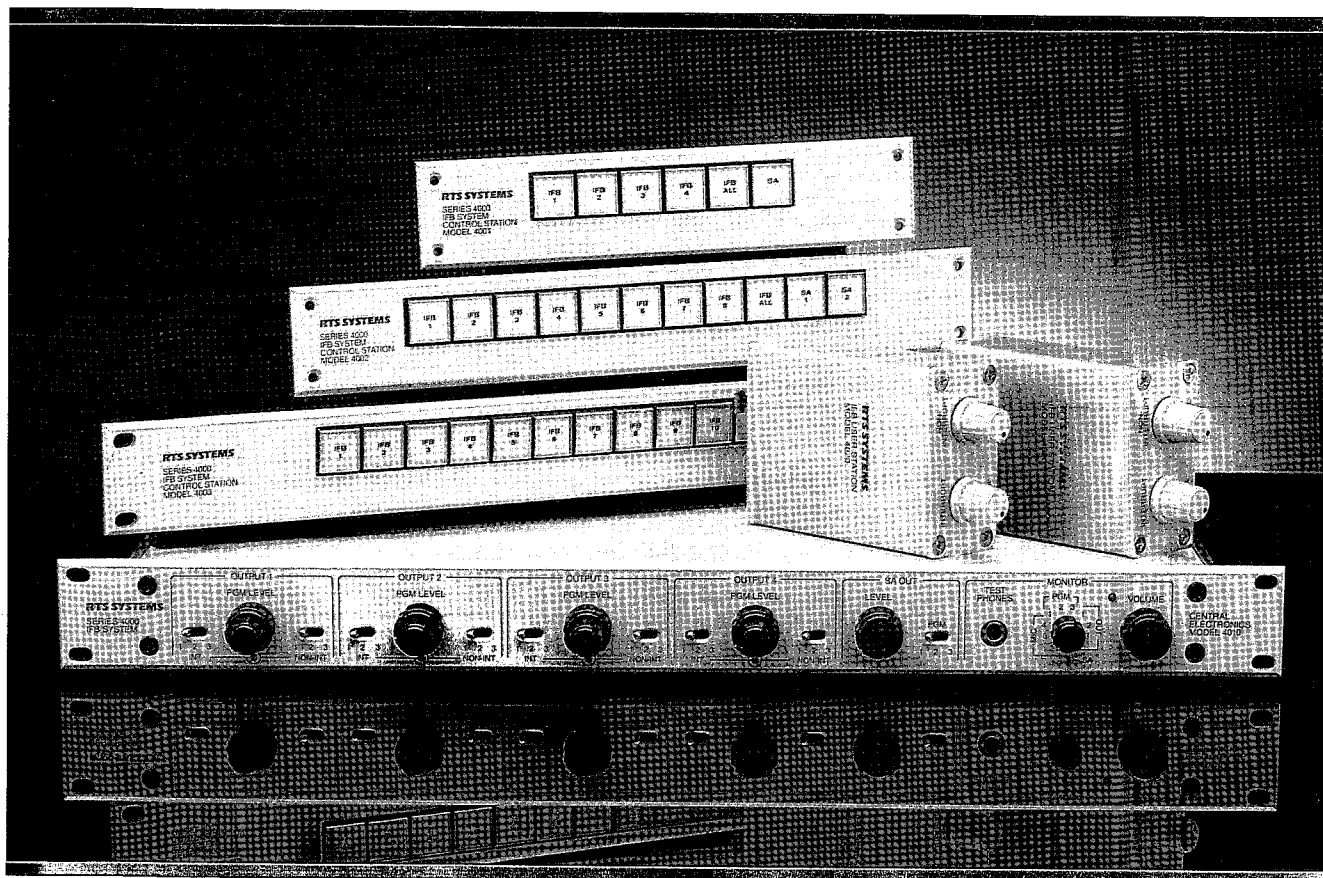
CENTRAL ELECTRONICS

PORTABLE USER STATION/TALENT ELECTRONICS

SYSTEM INTERCONNECT ACCESSORIES



SERIES 4000 IFB SYSTEM OVERVIEW



INTRODUCTION

IFB is a television production trade acronym that stands for interrupted feed-back, interrupted fold-back, interrupted return-feed, and in some cases prompt-mute. The generic term "program interrupt" is also used for IFB, especially when a network return-feed is not required.

In the television broadcast industry, as well as other live media applications, IFB plays an important role in the behind the scenes activities that go together to make a production. Basically, an IFB system permits the director or producer to talk to the talent, typically an "on air" announcer, while that person is doing voice-over commentary either on-camera or off-camera in a live or taped production. We see this repeatedly on television when watching sports presentations, new shows, and a variety of regular and special event programs.

APPLICATIONS

There are numerous applications for IFB systems. From live media events to be taped and filmed productions, IFB plays an important role as a vital production tool.

In television broadcasting and production, IFB fulfills the communication needs of major event broadcasts, remote location news, and sports events where flawless, failsafe operations are dependent on extremely versatile and reliable talent and crew communications. Competitive news programming for local and network news depends heavily on IFB for cuing on-camera announcers, with or without a floor director or cue cards. The live "on-location" productions that are the trademark of TV news require continuous IFB communications between the on-scene reporter, the in-studio 'anchor,' and the studio director.

Television sports broadcasts typically use up to twelve separate channels of IFB to communicate with announcers in various locations on the field and in commentator booths. Major news and entertainment events such as the Space Shuttle flights, Presidential election coverage, historical medical firsts, beauty pageants, money raising telethons, the Olympics, and on and on... all demand IFB.

In radio, studio talk shows rely on IFB for silent cuing between the producer and the announcer. Live and taped studio interviews can be handled with precision thanks to program-interrupt between the producer, talent and guests. For live sports broadcasts, studio-to-location return-feeds provide vital information to announcers regarding commercial breaks and various news update bulletins.

When recording a live performance on the concert stage and in recording studios, orchestras and musical groups can hear direct cues from the conductor or the producer as well as the individualized music mix designated for each performer. Orchestra IFB communications are also used during live television broadcasts such as the Academy Awards, the Grammys, and other music performance-oriented telecasts. In fact, IFB is mandatory on occasions when the orchestra is located away from the stage, or even, in some cases, in another building.

INTRODUCTION TO SERIES 4000

As part of a continuing effort in the development of high technology professional communication systems, RTS Systems has designed and developed the first modular IFB System that meets the critical needs of national networks, local broadcasters, and production companies throughout the world. The Series 4000 consists of a group of components that defines the current state-of-the-art for sophisticated IFB Systems. The design was based on response to industry surveys, currently accepted operational practices, and direct studio and field experience by RTS Systems personnel.

The Series 4000 is designed from a "system" point of view. The system is modular and expandable in groups of four channels. It is comprised of user stations, control stations, central electronics, and a variety of accessories. The modular approach allows each installation to be configured in a manner which is best suited to the immediate requirements of the end user. Should the operational requirements increase in complexity, additional system components may be added to expand the system capability. A typical small system might consist of the following: from one to four control stations, one central electronics unit, four user stations, and assorted cable and interconnect assemblies. The basic elements for a maximum-size system would consist of four 12-channel control stations, three central electronic units, and twelve or more user stations, as well as three splitter assemblies and fifteen cable assemblies.

HOW IT WORKS

Those in control positions (the director, producer, or assistant director, for example) control the interrupt and/or announce functions via control stations. Those in receive positions (on-air talent, floor managers, studio or field crew, audience, talent and crew in remote locations) are on the receiving end of the user station feed or on the actual user station (talent electronics)

via headphones, headsets, earphones, and/or loudspeakers. In the middle, the central electronics unit provides all the necessary inputs and outputs, processing, switching, and power distribution.

In its simplest form, the system is designed to accept up to three channels of individual program signals for each group of four outputs. Any of the three inputs may be independently assigned, and their levels set to either the "interrupt" or "non-interrupt" channel to feed the left or the right side of the headphones worn by the talent. The program audio may be interrupted from a given control station (with a single button operation); a voice message, originating at that control station, now takes the place of the program audio. Since each control station may address each group of four outputs individually, up to four separate conversations may be carried on simultaneously. Also, the control stations may address any combination of outputs. Each control station has a predetermined level of priority which effects an override of the lower priority level control stations. Individual lamp tallies appear on each control station indicating that an output is being addressed by one of the other control stations.

The Model 4010 Central Electronics unit plays the key role in the system. Each control station and user station ties into it. It performs the necessary silent electronic switching between program and voice assigns and sets the program levels to the talent, supplies the power to the user stations, and provides convenient monitoring functions.

The Model 4020 User Station is the final link in the chain. Here, the two channels of program audio are amplified to a level loud enough to drive the headphones or even a small bookshelf loudspeaker if desired. Two separate volume controls allow the talent to set the desired listening level without interfering with the interrupt mix. The user station receives dedicated audio signals and amplifier power from the central electronics via standard microphone cable, or almost any type of three conductor cable.

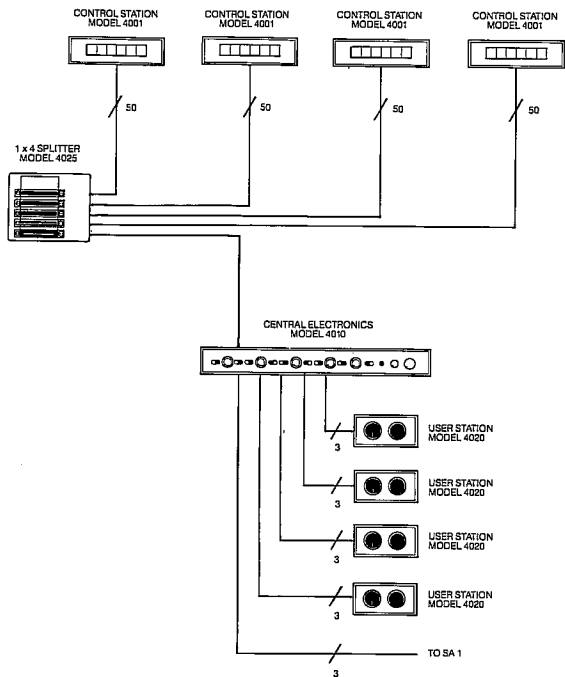
DESIGN

The fundamental design approach for the Series 4000 IFB System is based on several special characteristics of the RTS TW Intercom System:

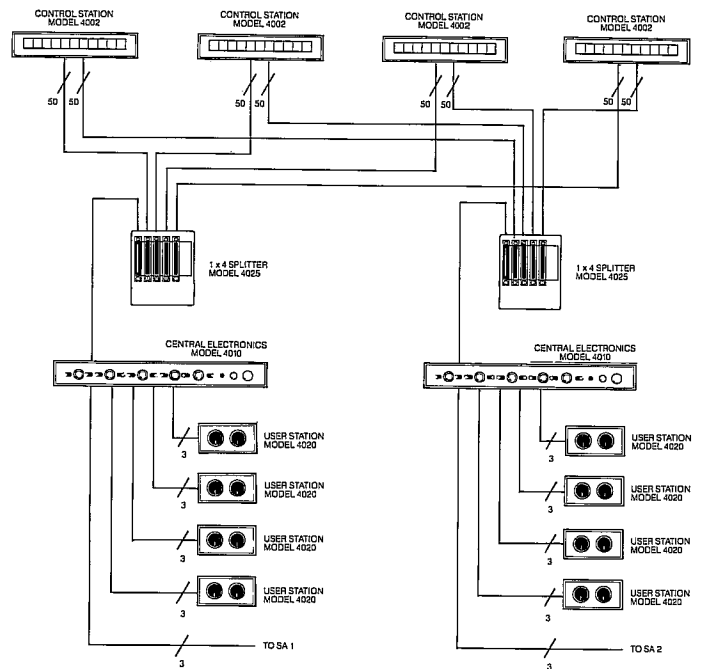
- ☐ The concept of running "line level" signals to the receiving locations and then boosting them, via local amplifiers, to power-levels. This reduces the chance of adjacent cable crosstalk and noise pickup.
- ☐ The convenience of using standard microphone cable for the IFB outputs to the user stations.
- ☐ The ability to send two discrete signals: an interrupt and a non-interrupt signal, or two separate program audio signals.

The incorporation of these field proven features, along with the program assignment, level adjustment, multiple control and tally functions make the Series 4000 a convenient, flexible and powerful IFB System.

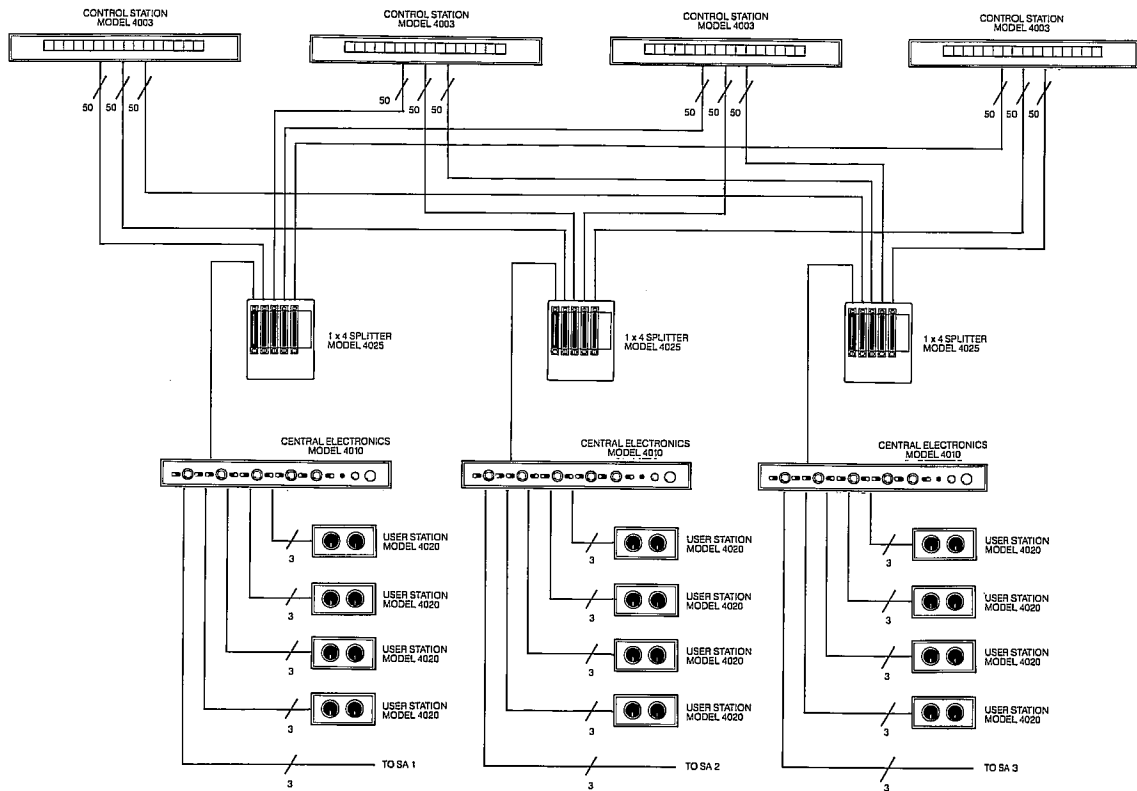
SERIES 4000 IFB SYSTEM APPLICATION DIAGRAMS



Typical Configuration #1

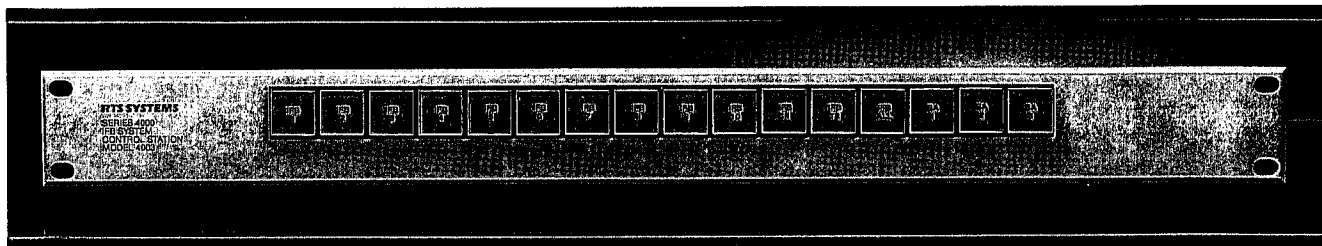
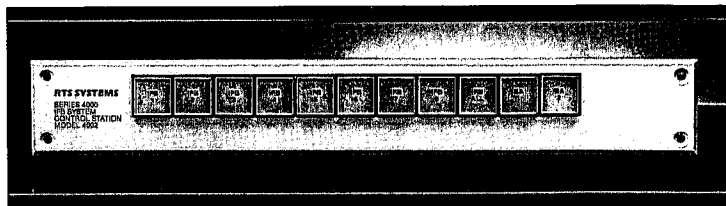
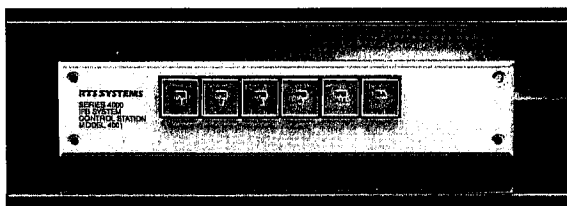


Typical Configuration #2



Typical Configuration #3

MODELS 4001, 4002, 4003 CONTROL STATIONS



INTRODUCTION

The Series 4000 IFB System Control Stations are designed to provide the necessary switching commands and voice signal origination that ultimately becomes the part of the composite IFB signals to the talent user stations. Each station provides a given number of switch functions according to its model number. (All switches are illuminated momentary pushbuttons with brightness levels.) The 4001 has six switches: IFB-1 thru IFB-4, IFB ALL, and SA (studio announce). The 4002 has eleven switches: IFB-1 thru IFB-8, IFB ALL, SA-1, and SA-2. Model 4003, with sixteen switches, provides IFB-1 thru IFB-12, IFB ALL, SA-1, SA-2 and SA3.

MICROPHONES

Each model control station can be ordered with a high-quality gooseneck microphone permanently attached to the top panel. (An "M" suffix model need not be ordered.) A terminal-strip connection on the control station microphone preamplifier circuit accepts a microphone-level or line-level signal from the existing microphone. Any convenient nearby microphone may be used, i.e., an intercom headset microphone, audio-slate microphone, etc.

INTERCONNECT

Interconnect between control stations and the 4010 Central Electronics unit is accomplished via 25-pair cable with microribbon connectors. All of the control station cables converge at the 4025A Splitter Assembly while a single cable then connects to the 4010. This configuration allows for up to four Model 4001 Control Stations to connect to a single electronics unit. The 4025A cross-connects all of the tally wires between control stations to provide usage information to all of the others when a given button is pushed. That is, if control station number one presses IFB-1, all other control stations will tally on their respective IFB-1 buttons.

PRIORITIES

In addition to all the tallies; there are four levels of priority. Each station is assigned a dedicated level of priority by which one control station can override another. Priority levels are programmable and may be set up at the time of installation. If desired, the priority levels may be defeated for equal control station priority.

POWER

Each control station is supplied with a small AC power supply for powering the lamps and local electronics. This allows the signal-carrying interconnect cables (to the central electronics and other control stations) to remain dry, avoiding the risk of a problem cable affecting power to the entire system. If desired, a central power supply can be used for powering all of the control stations, with 14 volts AC or 18 volts DC.

CHOOSING A CONTROL STATION

If one Model 4010 Central Electronics unit is used, the correct control station(s) would be the Model 4001. If two central electronics units are used, the Model 4002 may be employed in up to four locations. Three 4010's would require up to four Model 4003 control stations. A 4002 or 4003 may be used with a single 4010 if future growth is anticipated; this allows for system expansion without component replacement and obsolescence.

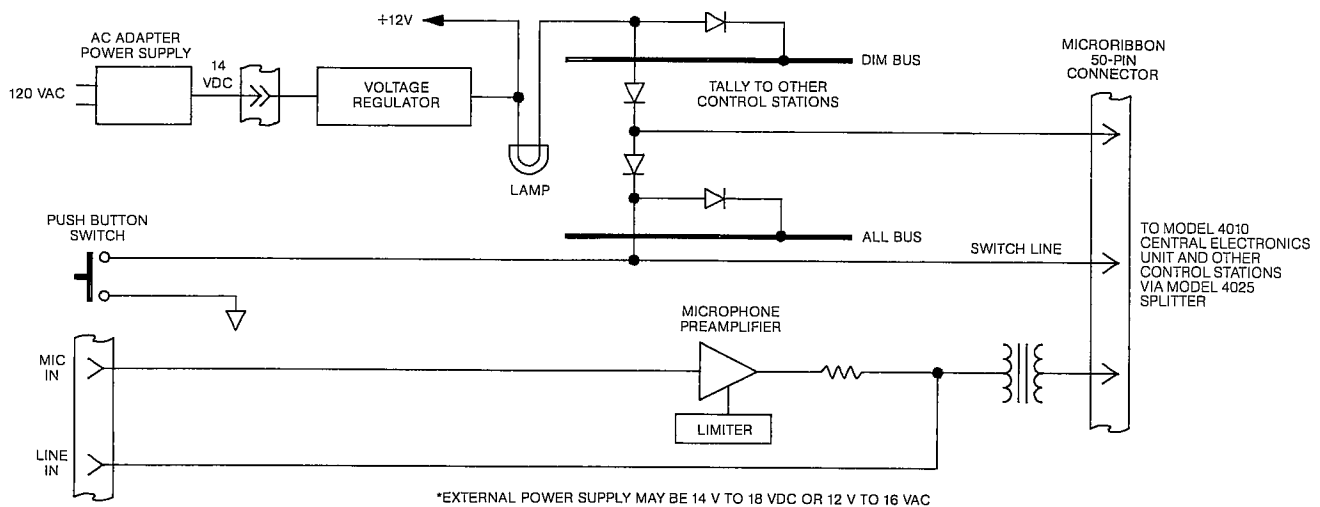
ACCESSORIES

Each control station can be mounted in a console or table surface as well as standard 19" EIA equipment racks. To allow Models 4001 and 4002 to be installed in a rack, two rack mount adapters are available: Model 4001-RMA and Model 4002-RMA. The dimensions of these two units are 1.72" H x 19" W x 0.180" D / 43.7 H x 482.6 W x 86.4 D mm.

Models 4001, 4002, 4003 Control Station Specifications

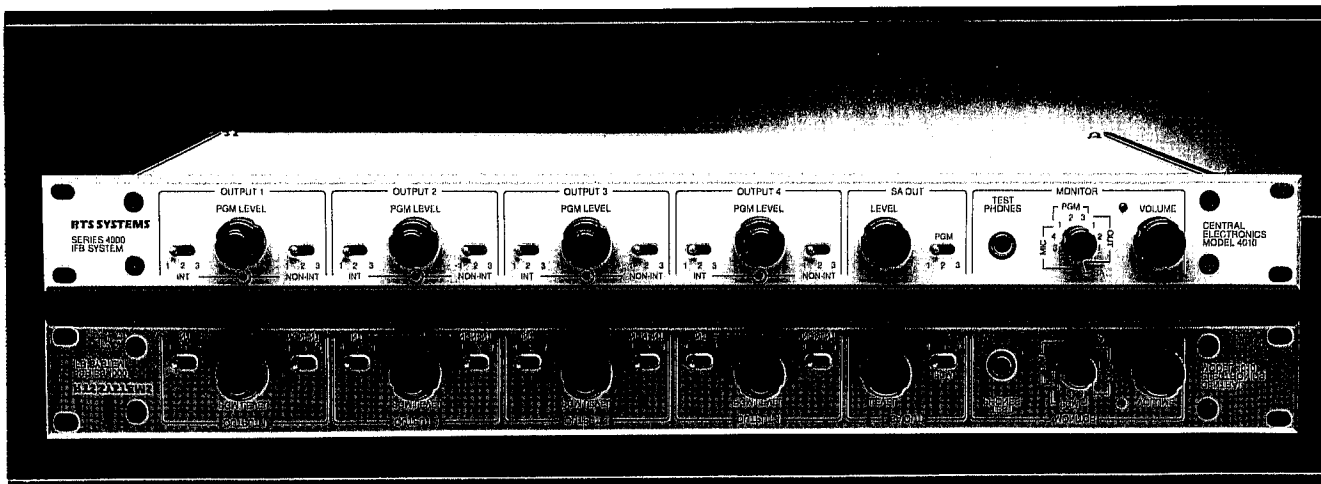
Microphone Preamplifier	
Frequency Response	+10, -3 dB 50 Hz to 16 kHz
Signal-to-Noise Ratio	58 dB
Total Harmonic Distortion	0.2%
Nominal Input Level	
Microphone	123 mV p-p
Line	-15 dBV to -5 dBV
Input Impedance	
Microphone	Unbalanced input 470 ohms
Line	4.7 k ohms
Gain	54 dB to 14dB
Nominal Output Level	
	-10 dBV, balanced, Z = 300 ohms
Size and Weight	
4001/4001M	1.72" H x 8.5" W x 3.4" D 2.1 lbs./2.7 lbs. 43.7 H x 215.9 W x 86.4 D mm .953 kg/1.225 kg

Size and Weight	
4002/4002M	1.72" H x 12.25" W x 3.4" D 2.3 lbs/2.9 lbs. 43.7 H x 311.2 W x 86.4 D mm 1.043 kg/1.32 kg
4003/4003M	1.72" H x 19.0" W x 3.4" D 2.4 lbs./3.0 lbs. 43.7 H x 215.9 W x 86.4 D mm 1.089 kg/1.361 kg.
Power Pack	
	2.0" H x 2.37" W x 2.62" D 1.4 lbs. 50.8 H x 60.33 W x 66.68 D mm 0.635 kg
Power Requirement	
4001/4001M	14 VAC @ 200 mA
4002/4002M	14 VAC @ 450 mA
4003/4003M	14 VAC @ 1.0 amps



Model 4001, 4002, 4003 Control Station Block Diagram

MODEL 4010 CENTRAL ELECTRONICS



INTRODUCTION

The Model 4010 Central Electronics unit contains all the necessary control functions and electronics to provide the active link between Models 4001, 4002, or 4003 Control Stations and Model 4020 User Stations. It performs the silent electronic switching between program and voice, assigns the program channels to the appropriate outputs, sets the program/voice level mix to the talent, and supplies two channels of composite audio, combined with a DC voltage, to the Model 4020 User Stations. In addition, it provides convenient front panel monitoring facilities for set-up and testing.

The 4010 input section accepts three program audio signals from external sources as well as the microphone and switch keying signals from up to four control stations. All audio inputs are bridging, transformer-balanced and isolated to avoid ground loops.

The 4010 output section supplies the composite-mix feeds to the user stations and SA (stage announce) amplifiers, as well as relay contacts for loudspeaker monitor muting. Outputs include short circuit and overvoltage protection as well as RFI bypass circuitry.

System levels and impedances are similar to standard professional audio parameters allowing 'side-by-side' cable runs and simple interfacing.

IFB CHANNELS

The 4010 provides four separate two-channel stereo outputs designed to feed from one of three 4020 User Stations. Of each output pair, one channel (the "interrupt" channel) contains a DC voltage on which the audio signal is superimposed; the DC voltage supplies power to the 4020 headphone amplifiers. The other channel (the "non-interrupt" channel) supplies dry audio signals without the DC voltage potential.

For mono operation, the non-interrupt channel can be assigned the same signal as the interrupt channel via an internal assignment switch. The user station may now have the interrupt signal in both ears when using stereo headphones.

STAGE ANNOUNCE

The SA function is similar to the interrupt channel of a user station feed, except that it is dry and transformer-balanced. The line-level output signal may be amplified and sent to a stage-announce loudspeaker, dressing room loudspeaker system or any other area requiring paging with or without program.

The program signal assigned to the SA output can be interrupted by a microphone signal from any of the control stations. If program is not required at this output, the program level control can be turned off so only the microphone signal is heard when keyed on.

When the SA function is used, two internal relays are activated. Their contacts can be connected to a local loudspeaker amplifier input. This serves to mute the local monitor speaker and prevents feedback when the SA is in use. Circuit board jumpers may be programmed to allow two separate areas of speaker muting, e.g., the audio control stations' SA function may be engaged to mute that local loudspeaker, and vice-versa.

MONITOR

A front panel monitor section allows for selectable monitoring of any input or output signal via a stereo phone jack. With this feature, program to voice levels can be balanced prior to plugging in the user stations. The headphone volume control and source selector switch affect only the monitor circuits and do not interfere with other functions.

SET-UP

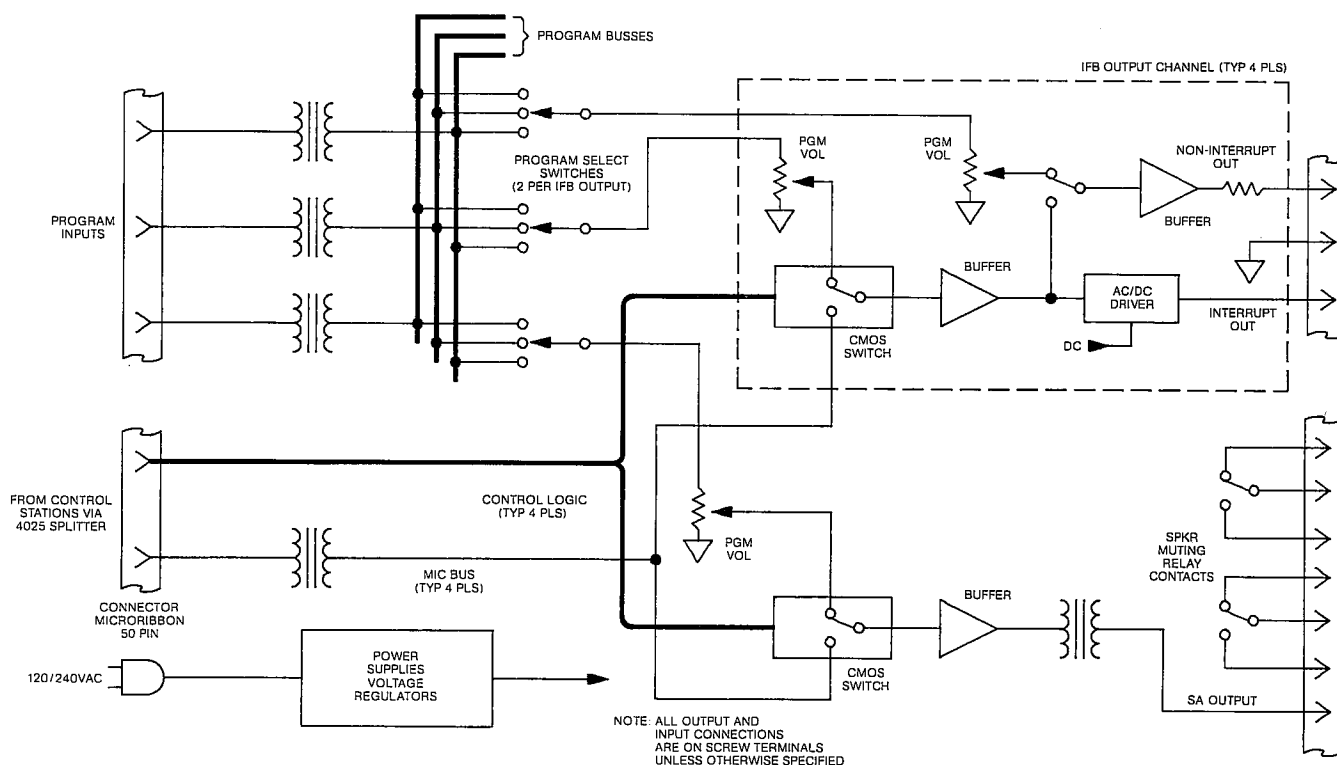
Establishing a balance between the external program audio input and the voice audio input (from the control station) is a simple procedure. The voice audio signal is used as the base reference since its level is not adjustable, and the program audio level is then adjusted to match it. The voice audio is peak limited to avoid exceeding safe listening volumes.

Model 4010 Central Electronics Specifications

Frequency Response 30 Hz to 16 kHz	+1, -2 dB
Noise*	
Interrupt channel	-78 dBV
Non-interrupt channel	-83 dBV
Total Harmonic Distortion	0.5%
Nominal Input Level	
Microphone @ line level	-10 dBV / input Z = 2k ohms
Program	0 dBV / input Z = 2k ohms
Nominal Output Level	
To User Stations	-8 dBV / Unbalanced, Z = 10 ohms
To SA amplifier	-5 dBV / Balanced, Z = 800 ohms

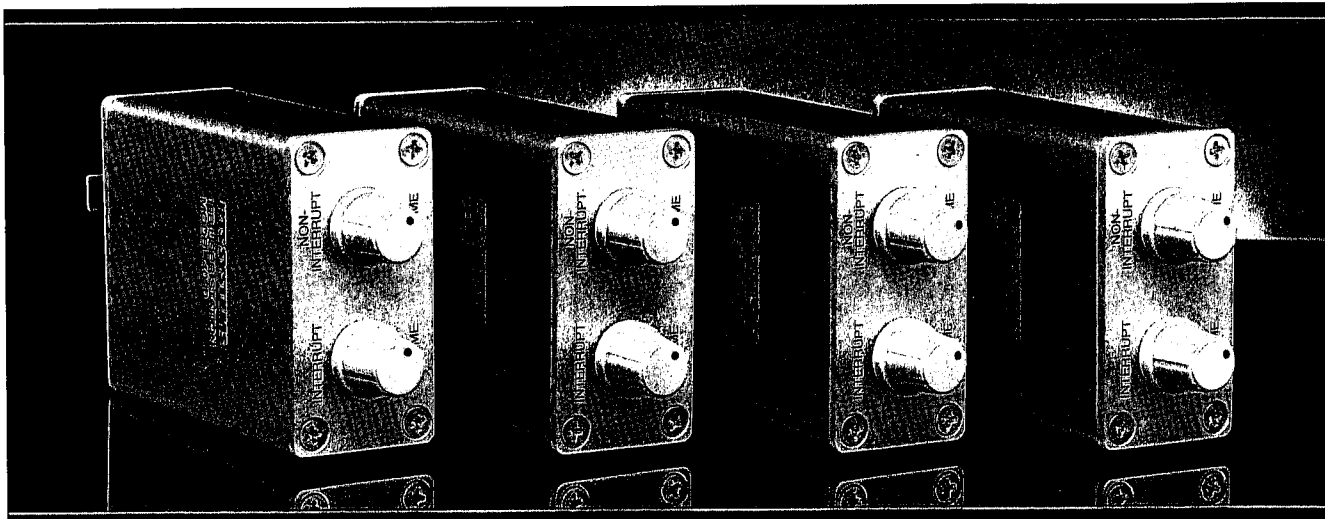
Crosstalk	
From other program inputs	-67 dBV
Between left & right channels	-64 dBV
Dimensions/Weight	
	1.72" H x 19" W x 15" D
	10.4 lbs.
	43.7 H x 215.9 W x 381 D mm
	4.7 kg
Mains Power	
Consumption	45 volt-amperes
	120/240 VAC, 50/60 Hz

*Ref: 0.5 V @ 1 kHz, measured at output terminal terminated into 600 ohms @ +10 dBV, 20 Hz to 20 kHz, average responding meter.



Model 4010 Schematic Block Diagram

MODEL 4020 PORTABLE USER STATION / TALENT ELECTRONICS



INTRODUCTION

The Model 4020 User Station, a small "belt pack" package, allows the user to receive audio signals as designated by the central electronics unit. It is the electronics package typically used by personnel such as newscasters, sportscasters, musicians, etc.

Each 4020 User Station contains the necessary electronics to provide a stereo audio signal to the user. Two power amplifiers rated at $\frac{1}{2}$ watt each are capable of driving almost any set of headphones, earphones, or even small loudspeakers. Hence the IFB can be conveniently extended to dressing rooms or other off-camera areas where communications with or without headphones are desirable.

In many operations, it is convenient to have one announcer on a given IFB channel. This is easily accomplished with a Model TW5W 1x5 Splitter Assembly or a pair of XLR-type "Y" cords. The line is split at the end location and fed to the 4020's. Since each 4020 is bridging to the line, up to three stations can be paralleled across a single output of the 4010 Central Electronics Unit.

SIGNALS

The line input to the belt pack is driven from the central electronics unit. This signal contains two discreet channels of audio information as well as the DC voltage necessary to power the 4020 circuitry.

Separate connectors are provided for either mono or stereo headphones. The interrupt channel feeds the mono headphone jack and the left ear output of the stereo headphone jack. Individual channel volume controls enable the user to adjust the interrupt and non-interrupt listening levels for personal comfort.

Since the balance between program and voice is set at the 4010 Central Electronics unit, the volume controls at the 4020 adjust the composite mix only, preventing the user from upsetting the balance between the two signals. Also, each user station may easily be modified to limit the volume range so that it may not be turned down all the way.

LONG LINES

The outputs from the 4010 Central Electronics to the user stations are unbalanced, very low impedance line-level signals that may conveniently be sent over standard two-conductor shielded microphone cable. If unavailable, almost any type of cable will work, including telephone cable, multi-cable, etc. However, three conductors are necessary for two channels of audio while two conductors are necessary for two channels of audio while two conductors will provide one channel of audio.

Since the signals are approximately line-level they can lie juxtaposed with other standard broadcast line-level signals without fear of crosstalk. The 5 ohm output impedance of the 4010 resists RFI and noise problems over almost any length of cable. In fact, the user station can work at a distance of up to 2500 feet (22 gauge wire) and with an optional battery adapter, this range can be extended to 5000 feet. The 4010 supplies 32 volts DC while the 4020 requires only 18 volts DC for optimum performance; a loss over cable lengths of almost 14 volts can be incurred before performance degradation.

RETURN-SEND

A return-send function may be incorporated with some small modifications. This feature allows the talent at the user station to talk privately with the control station(s) via a closed-circuit loop.

A user-installed switch at the user station applies a heavy load (typically a small lamp) across the left channel line. In turn a sensor circuit in the 4010 allows an external relay to switch the announcers "on-air" microphone off-the-air and directly to a separate amplifier and loudspeaker near the control station.

Model 4020 User Station Specifications

Frequency Response	+10, -3 dB
75 Hz to 10 kHz	
Noise*	
Interrupt channel	-61 dBV
Non-interrupt channel	-65 dBV
Total Harmonic Distortion	0.95%
Nominal Input Level	
Interrupt channel	-10 dBV/input Z = 50,000 ohms
Non-interrupt channel	-10 dBV/input Z = 50,000 ohms
Nominal Output Level	+7 dBV/Unbalanced, Z = 10 ohms
Crosstalk	-64 dBV
Between left & right channels	

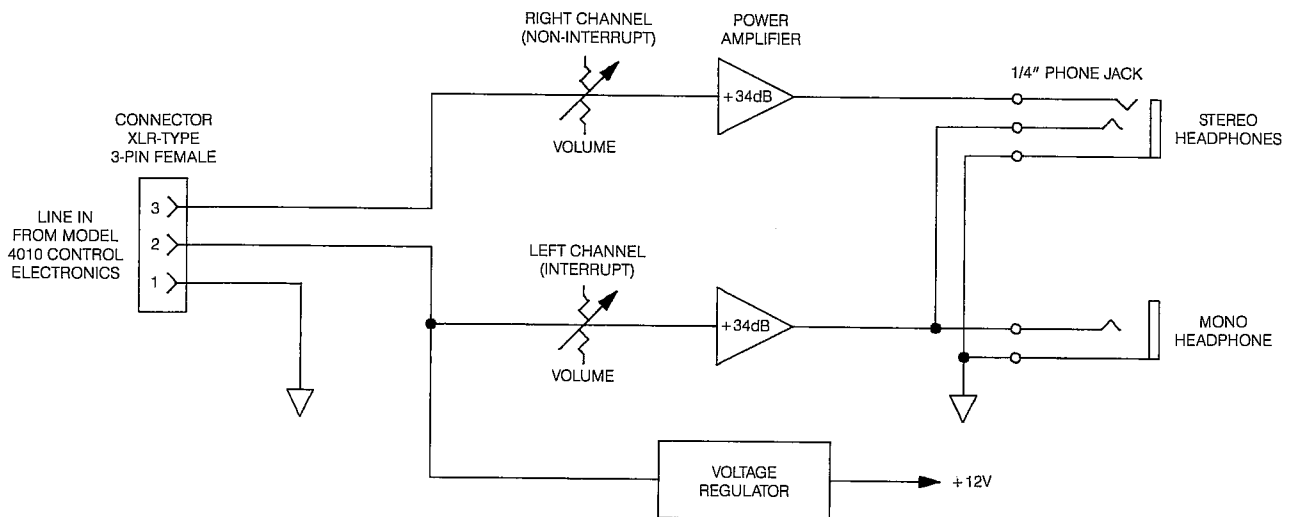
Temperature Ranges

Operating	-10° C to +50° C
Storage	-40° C to +70° C
Dimensions/Weight	5.2" H x 1.5" W x 3.0" D — 0.8 lbs. 132.08 H x 38.1 W x 76.2" D mm 0.363 kg

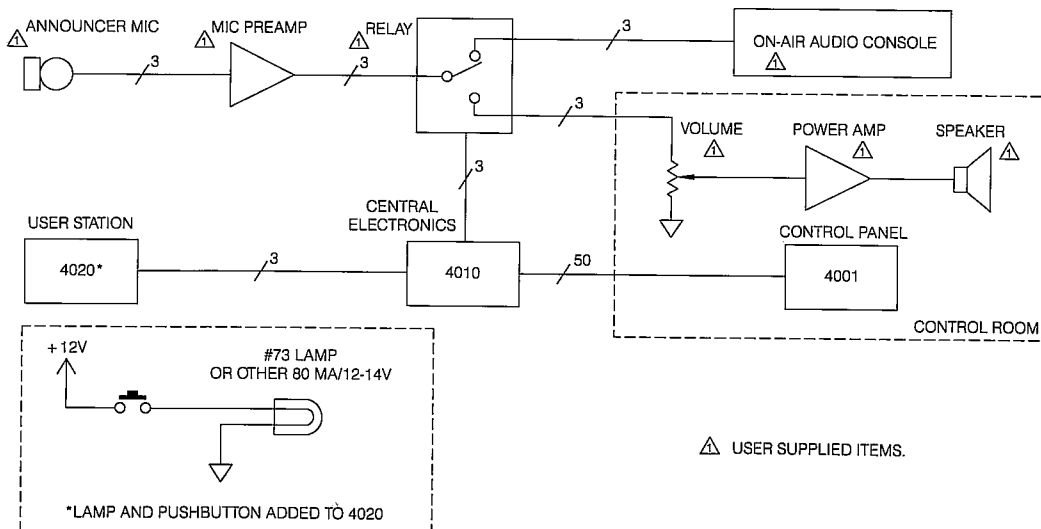
Power

Operating range:	12 to 28 VDC
Consumption:	225mA

*Ref: 0.5 V @ 1 kHz, measured at output terminal terminated into 600 ohms @ +10 dBV, 20 Hz to 20 kHz, average responding meter.
All product information and specifications subject to change without notice.



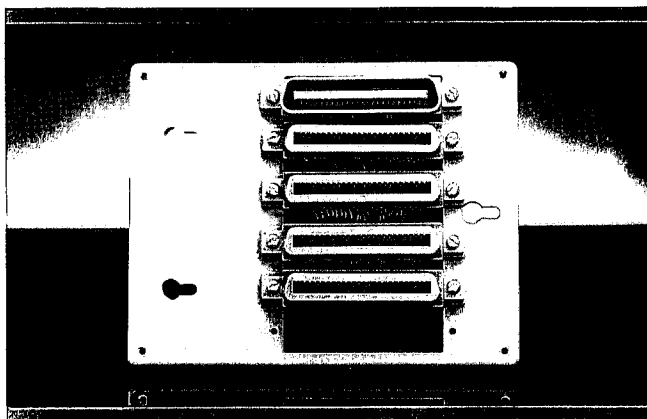
Model 4020 Schematic Block Diagram



Return Send Block Diagram

MODELS 4025A, 4022, 4015 SYSTEM INTERCONNECT ACCESSORIES

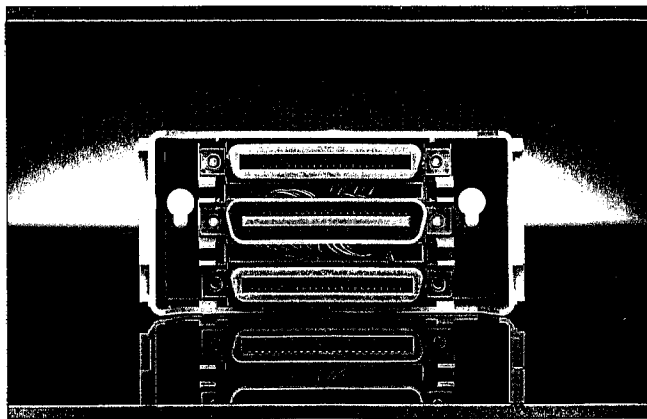
MODEL 4025A 1 x 5 SPLITTER ASSEMBLY



DESCRIPTION

Model 4025A Splitter Assembly is designed for applications involving 50-pin microribbon connectors (Amphenol 57 series or equivalent). A single male connector parallels four female connectors with pin-for-pin wiring. All connectors are held securely in place with a snap-on cover housing.

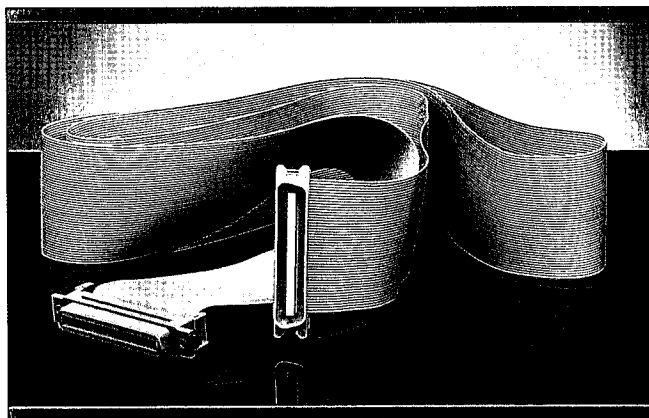
MODEL 4022 1 x 2 SPLITTER ASSEMBLY



DESCRIPTION

Model 4022 Splitter Assembly is designed for applications involving 50-pin microribbon connectors (Amphenol 57 series or equivalent). A single male connector parallels two female connectors with pin-for-pin wiring. All connectors are held securely in place with a snap-on cover housing.

MODEL 4015-F FLAT CABLE ASSEMBLY

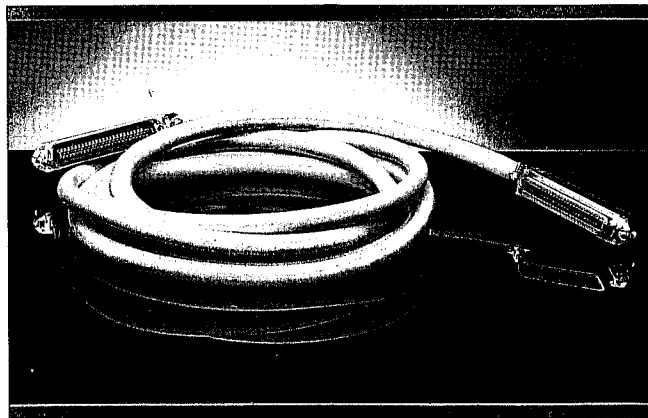


DESCRIPTION

Model 4015 Cable Assembly is pre-wired double-ended connector/cable assembly with one male connector and one female connector. It uses 50-pin microribbon connectors (Amphenol 57 series or equivalent) that are wired pin-to-pin.

The ribbon-wire assembly employs a plastic insulation displacement connector using #28 gauge stranded wire. It is recommended for light duty applications since a protective outer sheath is not available.

MODEL 4015 ROUND CABLE ASSEMBLY



DESCRIPTION

A standard round cable with a thick vinyl outer sheath provides a durable assembly for use in cable troughs and outdoor environments. This cable features #24 gauge stranded wire in a 25-twisted-pair configuration. The individual wire pairs and complete termination groups are twisted into varied lays to minimize crosstalk where applicable.

Each cable is visually inspected and electrically tested to insure proper wiring and freedom from defects. Both types of connectors feature gold-plated contacts to prevent oxidation.

Note: Flat ribbon cable available in 5 ft. length only.



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